

# Effect of A1c Levels on 30-Day Complications After Elective Anterior Cervical Discectomy and Fusion

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Disclosures: The authors report no conflicts of interest.

## INTRODUCTION

Anterior cervical discectomy and fusion (ACDF) is one of the most common spinal procedures. Diabetes mellitus is highly prevalent among ACDF patients, and elevated hemoglobin A1c (HbA1c) has been implicated in postoperative risk. However, the association between HbA1c and 30-day complications after ACDF remains unclear. This study analyzed whether increasing HbA1c levels are associated with postoperative complications and whether a clinically meaningful cutoff exists.

## METHODS

Using the 2021–2023 ACS-NSQIP registry, 10,508 adult elective ACDF patients with HbA1c values were included. Patients were stratified into 5 HbA1c groups: <5.7%, 5.7–6.49%, 6.5–7.49%, 7.5–8.49%, and ≥8.5%. Outcomes included surgical site complications, sepsis, readmission, major/minor complication composites, and discharge disposition. Multivariable logistic regression was performed with <5.7% as reference. Trend testing and ROC analysis with Youden's J statistic were used to assess dose-response and identify potential HbA1c thresholds.

## RESULTS

Baseline demographics varied significantly across HbA1c groups. Unadjusted readmission increased from 3.1% (<5.7%) to 5.5% (≥8.5%,  $p < 0.001$ ). On adjusted analysis, HbA1c ≥8.5% independently predicted unplanned readmission (OR 1.72; 95% CI 1.10–2.59;  $p = 0.012$ ). HbA1c 7.5–8.49% was associated with increased odds of sepsis (OR 2.53; 95% CI 0.95–6.15;  $p = 0.048$ ). Cochran-Armitage testing demonstrated significant increasing trends for any complication ( $p = 0.015$ ), minor complications ( $p = 0.021$ ), myocardial infarction ( $p = 0.014$ ), and unplanned readmission ( $p < 0.001$ ). ROC analysis yielded poor discriminatory ability (AUC 0.519–0.564) with no clinically useful cutoff.

## DISCUSSION

Elevated HbA1c, particularly ≥7.5%, is associated with greater risk of sepsis and readmission after ACDF. However, HbA1c alone does not reliably predict complications, suggesting its role should remain within comprehensive perioperative assessment rather than as a sole determinant of surgical eligibility.

## SIGNIFICANCE/CLINICAL RELEVANCE

HbA1c levels ≥7.5% increase risk for certain adverse outcomes after ACDF, underscoring the importance of perioperative glycemic optimization and close postoperative monitoring in diabetic patients. However, no single HbA1c cutoff provides adequate predictive utility for clinical decision-making.

Variable	Surgical Site Complication OR (95% CI)	Sepsis/Septic Shock OR (95% CI)	Returns to OR OR (95% CI)	Major Complication OR (95% CI)	Minor Complication OR (95% CI)	Any Complication OR (95% CI)	Unplanned Readmission OR (95% CI)
A1c <5.7-6.49%	0.66 (0.38-1.10); p=0.118	1.16 (0.54-2.48); p=0.697	0.84 (0.59-1.20); p=0.350	0.85 (0.64-1.12); p=0.243	0.98 (0.70-1.36); p=0.895	0.90 (0.72-1.13); p=0.371	1.03 (0.80-1.33); p=0.802
A1c 6.5-7.49%	0.98 (0.53-1.74); p=0.945	1.18 (0.44-2.86); p=0.771	0.79 (0.48-1.24); p=0.324	0.76 (0.52-1.07); p=0.122	0.97 (0.63-1.45); p=0.881	0.85 (0.63-1.13); p=0.280	1.33 (0.99-1.78); p=0.053
A1c 7.5-8.49%	0.78 (0.29-1.72); p=0.567	2.53 (0.95-6.15); p=0.048	1.14 (0.64-1.91); p=0.649	1.14 (0.74-1.70); p=0.532	1.45 (0.88-2.30); p=0.129	1.25 (0.88-1.74); p=0.205	1.43 (0.97-2.06); p=0.061
A1c ≥8.5%	1.36 (0.55-2.87); p=0.459	0.57 (0.63-2.87); p=0.592	0.92 (0.43-1.76); p=0.819	1.05 (0.60-1.71); p=0.854	1.54 (0.83-2.65); p=0.141	1.27 (0.82-1.88); p=0.261	1.72 (1.10-2.59); p=0.012
Age (per year)	0.99 (0.98-1.01); p=0.467	1.03 (1.00-1.06); p=0.026	—	1.03 (1.02-1.04); p=0.001	1.03 (1.02-1.04); p=0.001	1.03 (1.02-1.04); p=0.001	1.03 (1.02-1.04); p=0.001
Male Sex	0.74 (0.49-1.12); p=0.156	—	1.54 (1.13-2.10); p=0.006	1.70 (1.35-2.16); p=0.001	0.67 (0.43-1.00); p=0.061	1.22 (1.01-1.47); p=0.039	1.33 (1.09-1.64); p=0.006
BMI (per unit)	1.03 (1.00-1.05); p=0.086	—	—	1.02 (1.00-1.04); p=0.030	—	1.02 (1.01-1.03); p=0.007	—
COPD	2.33 (1.11-4.41); p=0.015	—	—	—	1.93 (1.17-3.03); p=0.006	—	—
Smoker	0.68 (0.36-1.19); p=0.198	—	—	—	0.67 (0.43-1.00); p=0.048	—	—
Output	0.61 (0.40-0.91); p=0.018	0.21 (0.08-0.44); p=0.001	0.27 (0.19-0.39); p=0.001	—	—	0.50 (0.32-0.71); p=0.001	—

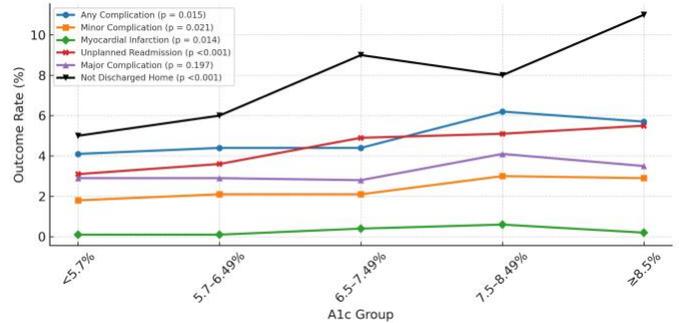


Figure 1. Cochran-Armitage trend plots across HbA1c groups

Table 1. Multivariable Logistic Regression for Complications