Risk Factors for Undergoing Surgical Intervention for Vertebral Compression Fractures: An Analysis of 703,499 Patients

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INTRODUCTION: Vertebral compression fractures are typically treated nonoperatively. When indicated, vertebral compression fractures are treated with either kyphoplasty or vertebroplasty. The decision whether to treat patients with or without surgical intervention is dependent on the severity of deformity and patient risk profile. Therefore, the aims of this study were to 1) compare patient demographics, 2) and identify risk factors regarding patients who underwent operative versus nonoperative management.

METHODS: The study conducted was a retrospective analysis that used patient information from January 1st, 2010, to October 31st, 2021. Cohorts were identified in the dataset by using syntax-based language with respect to International Classification of Disease, Ninth Revision (ICD-9), ICD-10, Current Procedural Terminology (CPT) and various other diagnostic and procedural codes. Cohorts consisted of patients who underwent kyphoplasty or vertebroplasty (CPT-22513, CPT-22514, CPT-22515, CPT-22520, CPT-22521). The two research domains utilized in this investigation were baseline demographic profiles of patients underwent kyphoplasty or vertebroplasty for the treatment of vertebral compression fractures and those who underwent nonoperative management served as the control cohort.

RESULTS SECTION: The query resulted in 76,126 patients who underwent kyphoplasty or vertebroplasty within 90 days of diagnosis of a vertebral compression fracture and 627,373 patients who did not undergo surgical treatment. Univariate analysis demonstrated female sex was associated with a statistically significant risk of undergoing surgical management for vertebral compression fracture. Several comorbidities were significantly associated with increased rates of readmission including lymphoma, metastatic cancer, and coronary artery disease ($p < 0.0001$ for all).

DISCUSSION: This study highlights specific comorbidities that are significantly associated with higher rates of kyphoplasty or vertebroplasty for the treatment of vertebral compression fractures.

SIGNIFICANCE/CLINICAL RELEVANCE: Certain patient specific factors may be associated with higher rates of surgical intervention for vertebral compression fractures. This study may facilitate more informed patient-doctor conversations and dual-decision making on possible surgical intervention for this pathology.

IMAGES AND TABLES:

Variables	Odds-Ratio	95%CI	*p*-value
Gender			
Male	**0.69**	**0.68-0.71**	**<0.0001**
Comorbidities			
Alcohol Use Disorder	**0.76**	**0.74-0.78**	**<0.0001**
Cancer	**1.37**	**1.35-1.39**	**<0.0001**
Cardiac Arrhythmia	**1.28**	**1.26-1.30**	**<0.0001**
Cerebrovascular Disease	**1.25**	**1.23-1.27**	**<0.0001**
Chronic Kidney Disease	**1.19**	**1.17-1.21**	**<0.0001**
Chronic Pulmonary Disease	**1.35**	**1.33-1.38**	**<0.0001**
Coagulopathy	**1.21**	**1.19-1.23**	**<0.0001**
Congestive Heart Failure	**1.16**	**1.13-1.19**	**<0.0001**
Chronic Obstructive Pulmonary Disease	**1.36**	**1.34-1.38**	**<0.0001**
Coronary Artery Disease	**1.38**	**1.36-1.40**	**<0.0001**
Dementia	**0.95**	**0.93-0.97**	**<0.0001**
Depressive Disorders	**1.14**	**1.12-1.15**	**<0.0001**
Diabetes Mellitus	**1.13**	**1.11-1.14**	**<0.0001**
Drug Abuse	N/A	N/A	0.863
Fluid and Electrolyte Abnormalities	**1.25**	**1.24-1.27**	**<0.0001**
Human Immunodeficiency Anemia	**0.66**	**0.58-0.75**	**<0.0001**
Hypertension	**1.8**	**1.76-1.84**	**<0.0001**
Hypothyroidism	**1.33**	**1.30-1.35**	**<0.0001**
Iron Deficiency Anemia	**1.29**	**1.27-1.31**	**<0.0001**
Ischemic Heart Disease	**1.3**	**1.28-1.32**	**<0.0001**
Liver Disease	**1.12**	**1.10-1.14**	**<0.0001**
Lymphoma	**1.71**	**1.65-1.76**	**<0.0001**
Metastatic Cancer	**1.51**	**1.47-1.54**	**<0.0001**
Obesity	N/A	N/A	0.977
Peripheral Vascular Disease	**1.37**	**1.35-1.39**	**<0.0001**
Paralysis	**0.92**	**0.89-0.95**	**<0.0001**
Peptic Ulcer Disease	**1.31**	**1.27-1.34**	**<0.0001**
Psychoses	**0.77**	**0.75-0.80**	**<0.0001**
Renal Failure	**1.11**	**1.09-1.14**	**<0.0001**
Rheumatoid Arthritis	**1.36**	**1.32-1.40**	**<0.0001**
Tobacco Use	**1.18**	**1.17-1.20**	**<0.0001**
Valvular Disease	**1.37**	**1.35-1.39**	**<0.0001**
Pathologic Weight Loss	**1.2**	**1.18-1.22**	**<0.0001**

Table 2. Multivariate binomial logistic regression on patient-specific risk factors associated with hospital readmissions within ninety days following kyphoplasty or vertebroplasty for the treatment of vertebral compression fractures. Bolded values indicate statistically significant risk factors.