Predictors of Emergency Department Return Within 90 Days of Operative Management of Traumatic Spinal Fractures

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INTRODUCTION: Traumatic spinal fractures are a cause of significant morbidity, including pain as well as neurological and functional deficits. Surgical intervention is frequently indicated to stabilize the spine and mitigate the risk of further neurological or mechanical injury. Despite appropriate management, some patients return to the emergency department (ED) within the early postoperative period, reflecting complications, unmet clinical need, or challenges in rehabilitation. Identifying the key factors that contribute to these visits is essential for optimizing postoperative care and improving patient outcomes. Accordingly, this study aims to characterize the social, clinical, and operative factors associated with 90-day ED return following surgery for traumatic cervical and thoracolumbar spinal fractures.

METHODS: A retrospective cohort study was performed, characterizing 199 patients with traumatic cervical or thoracolumbar spinal fractures who were treated operatively at a Level I safety-net hospital between January 2013 and December 2024. Our institutional IRB approved this retrospective study with a waiver of informed consent. Risk factors for return-to-ED were classified as operative/clinical variables (length of stay (LOS), days to surgery, BMI, laminectomy, ambulatory status at discharge), injury characteristics (mechanism of injury, associated injuries), and social determinants of health (SDOH) (language, marital status, tobacco use, combined SDOH vulnerability score). Associations between each predictor variable and 90-day return to the ED were assessed using univariable logistic regression, implemented as generalized linear models with a binomial family. Patients were categorized based on the location of the spinal injury (i.e., cervical vs. thoracolumbar). Statistical significance was defined as $p < 0.05$.

RESULTS: During the study period, 199 patients (38 women, mean [SD] age, 48.5 [15.9] years) were identified who met the inclusion criterial. Of the 199 patients, 90 presented with cervical spinal trauma, and 109 had thoracolumbar fractures. A total of 46 patients (21 cervical, 25 thoracolumbar) returned to the ED within 90 days following discharge for a variety of indications. In both cohorts, return to ED was significantly associated with the number of operative levels (cervical: OR 1.26, CI 1.01-1.61, p = 0.041; thoracolumbar: OR 1.30, CI 1.06-1.63, p = 0.015) and LOS (cervical: OR 1.04, CI 1.02-1.07, p = 0.002; thoracolumbar: OR 1.04, CI 1.01-1.07, p = 0.011). A laminectomy as part of the procedure was a significant predictor of 90 day return to ED within the thoracolumbar cohort (OR 6.18, CI 2.25-20.05, p < 0.001); however, it was insignificant with regard to cervical trauma (OR 1.50, CI 0.56-4.12, p = 0.421). None of the injury characteristics, including mechanism and associated injuries, had a significant association with return to ED. Likewise all SDOH variables were insignificant across both cohorts.

DISCUSSION: Return to the ED was associated with procedural factors, including increased number of operative levels and longer length of stay, in both cervical and thoracolumbar cohorts. In the thoracolumbar cohort, performing a laminectomy further increased the likelihood for ED return, whereas it was insignificant in cervical injuries. Notably, neither injury characteristics nor SDOH were associated with 90-day ED return. These results suggest that early postoperative ED visits are primarily driven by surgical complexity and inpatient recovery demands, rather than baseline injury severity or social risk factors. The role of surgical complexity and inpatient recovery in ED return is broadly consistent with prior studies. Consequently, targeted interventions such as enhanced discharge planning, patient education, and early postoperative follow-up may help mitigate preventable ED visits in this population.

SIGNIFICANCE/CLINICAL RELEVANCE: Early postoperative ED visits following spinal fracture are primarily influenced by procedural complexity rather than injury severity or social factors. Identifying high-risk patients may allow targeted interventions such as enhanced discharge planning and early follow-up, potentially reducing preventable ED utilization and improving patient outcomes.

IMAGES AND TABLES:

Table 1: Univariable logistic regression of risk factors for 90-day ED return.

Variable	Cervical Trauma OR (95% CI)	p-value	Thoracolumbar Trauma OR (95% CI)	p-value
Operative / Clinical Factors				
Number of operative levels	**1.26 (1.01–1.61)**	**0.041**	**1.30 (1.06–1.63)**	**0.015**
Length of stay	**1.04 (1.02–1.07)**	**0.002**	**1.04 (1.01–1.07)**	**0.011**
Days to surgery	0.97 (0.85–1.07)	0.628	0.98 (0.90–1.03)	0.602
BMI	0.94 (0.87–1.01)	0.123	1.01 (0.94–1.09)	0.708
Laminectomy	1.50 (0.56–4.12)	0.421	**6.18 (2.25–20.05)**	**<0.001**
Independent ambulatory status	0.69 (0.25–1.83)	0.456	0.42 (0.14–1.11)	0.095
Injury Characteristics				
Mechanism of Injury: MVC	0.61 (0.22–1.63)	0.329	0.77 (0.28–1.93)	0.579
Mechanism of Injury: Falls	0.78 (0.20–2.48)	0.069	1.16 (0.46–2.84)	0.754
Chest injury	1.34 (0.41–4.33)	0.627	0.14 (0.50–4.15)	0.535
Abdominal injury	1.81 (0.46–6.83)	0.380	2.20 (0.66–7.55)	0.198
Pelvic injury	2.72 (0.46–15.02)	0.246	1.29 (0.33–4.75)	0.707
Head injury	1.72 (0.54–5.35)	0.342	1.59 (0.14–2.21)	0.446
Extremity injury	1.67 (0.47–5.83)	0.418	1.22 (0.34–4.24)	0.755
Number of associated injuries	1.39 (0.93–2.10)	0.104	1.08 (0.76–1.53)	0.649
Social Determinants of Health (SDOH)				
SDOH vulnerability score	1.01 (0.87–1.16)	0.895	1.02 (0.89–1.15)	0.817
Spanish language	2.44 (0.86–6.86)	0.090	0.63 (0.23–1.63)	0.358
Marital status: married	2.42 (0.82–6.96)	0.102	0.64 (1.21–1.68)	0.371
Tobacco use	1.01 (0.94–1.06)	0.832	1.03 (0.99–1.07)	0.130