Chest Wall Injury Society

Title of Presentation National Variation and Temporal Trends in Guideline-Concordant Surgical Stabilization of Flail Chest

Background

For patients with flail chest, national guidelines have recommended surgical stabilization of rib fractures (SSRF) within 72 hours of admission since 2017. Despite these recommendations, national adherence remains poorly defined. This study evaluates patient- and hospital-level factors associated with guideline-concordant SSRF and quantified institutional variation across U.S. trauma centers.

Methods

Adult patients with flail chest were identified from the ACS-TQIP database (2017–2022). Guideline-concordant SSRF was defined as operative fixation within 72 hours of admission, excluding cases with nonsurvivable injuries (AIS 6) or severe neurologic injury (head AIS >3). Facility-year rates were used to evaluate temporal trends. Multivariable logistic regression clustered by facility-key identified independent predictors of guideline-concordant SSRF. A hierarchical mixed-effects model estimated facility-level random intercepts for guideline-concordant SSRF, visualized in a caterpillar plot to identify high- and low-performing centers.

Results

Among 40,406 patients with flail chest, 8,603 (21.3%) underwent SSRF, of which 4,821 (11.9%) were guideline-concordant (within 72 hours). The rate of any SSRF procedure performed increased from 17.2% in 2017 to 23.4% in 2022, while guideline-concordant SSRF increased from 8.5% to 14.3% ($P < 0.001$). Median time to procedure decreased from 72.3 hours (IQR 43.1–122.2) in 2017 to 62.8 hours (IQR 38.5–94.5) in 2022 ($P < 0.001$).

In adjusted analyses, the odds of guideline-concordant SSRF increased annually (2018 OR 1.21, 2019 OR 1.34, 2020 OR 1.47, 2021 OR 1.58, 2022 OR 1.59; all $P \leq 0.03$). Severe injury (ISS 16–24) was associated with greater odds of concordant SSRF (OR 1.32, 95% CI 1.20–1.45), while age was inversely associated (OR 0.997 per year, 95% CI 0.994–0.999). Hospital teaching status, bed size, and ownership type were not associated with guideline concordance, whereas Level 3 verification centers had significantly lower odds (OR 0.34, 95% CI 0.17–0.68).

In the hierarchical model of centers performing ≥3 SSRFs annually (n = 274), between-facility variance was substantial ($\sigma^2 = 0.59$; $P < 0.001$). Nineteen hospitals (7.1%) were high outliers for guideline concordance, and seven (2.6%) were low outliers.

Conclusion

Although national adherence to guideline-concordant SSRF has improved, significant institutional heterogeneity persists. The strong between-center variance suggests that structural and cultural factors—rather than case mix—are key determinants of concordance. Future initiatives should target dissemination of evidence-based SSRF timing protocols and incentivize adoption through performance benchmarking.

(OPTIONAL) Additional materials may be uploaded if desired. File name must include the last name of Author 1.

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