

Background

- Spine trauma in the elderly continues to increase in prevalence
- Spine trauma in elderly patients has an increased risk of mortality
- There is currently a paucity of data to predict mortality in elderly patients with traumatic spinal injuries
- A predictive calculator would help guide patients, families, and surgeons facing difficult clinical decisions regarding treatment



The Problem

- **Elderly patients are at increased risk of poor outcome following traumatic injury :**
 - ✓ **Poor reserve**
 - ✓ **Increased comorbidities**
 - ✓ **Increased risk of complication with surgical treatment**



The Problem

- It is not uncommon for patients to undergo a costly, dangerous, and painful spine surgery, only to die within the first 3 months after their injury.
- If we are reliably able to predict mortality following spine trauma in this population, it can help guide MDs discussing treatment options with families



Purpose

Goal → to assess a broad variety of patient and injury characteristics to develop a **predictive calculator** for mortality in elderly patients with spine trauma to better guide surgical decision making and prognostication



Study Design and Patient Selection

- Patients were identified using CPT and ICD-10 codes from an institutional trauma database spanning January 2010 to January 2019.
- Retrospective chart review collected data on patient and injury characteristics, management of injury and outcomes.
- Primary outcome → all-cause mortality



Statistical Analysis

- Between-group comparisons made using Wilcoxon rank-sum or Pearson's chi-squared tests.
- Survival curves were estimated using the Kaplan-Meier method.
- **Multivariable logistic regression model** was fitted for **90-day mortality** on a variety of characteristics.
- **Multivariable Cox proportional hazard model** was fitted to predict patient survival up to 9 years after spine trauma presentation.



Results – Cohort Characteristics

- Population Size: 1,746 patients
- Mortality: 631 during follow-up, 359 within 90 days
 - ✓ Average age of the 90-day mortality cohort significantly older (79.6 vs. 76.0 years) than the non-mortality cohort.
 - ✓ Comorbidities (smoking status, BMI, diabetes, pulmonary disease, hypertension, and use of anticoagulation) evenly distributed between the mortality & non-mortality cohorts.
 - ✓ Higher rates of hypotension upon presentation and cardiac disease in the mortality cohort



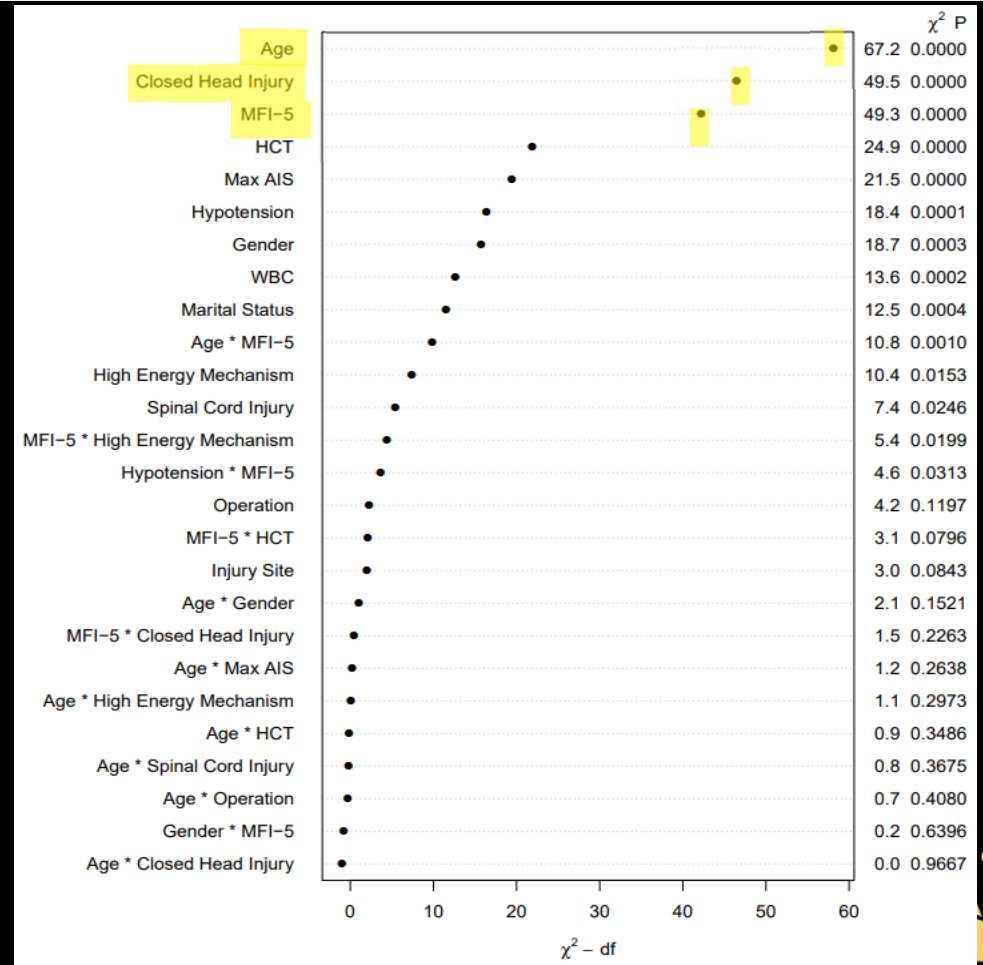
Results – Injury Characteristics

- Mortality cohort had higher Injury Severity Score (ISS) at presentation, Abbreviated Injury Score (AIS) and Modified 5-item Frailty Index (MFI-5) than the non-mortality cohort.
- Radiographic indicators (Psoas Index or L3 Hounsfield Units) were not significantly different for the groups.
- The presence / absence of a neurologic deficit (ASIA A/B/C/D vs ASIA E) were significantly different between the mortality and non-mortality group.



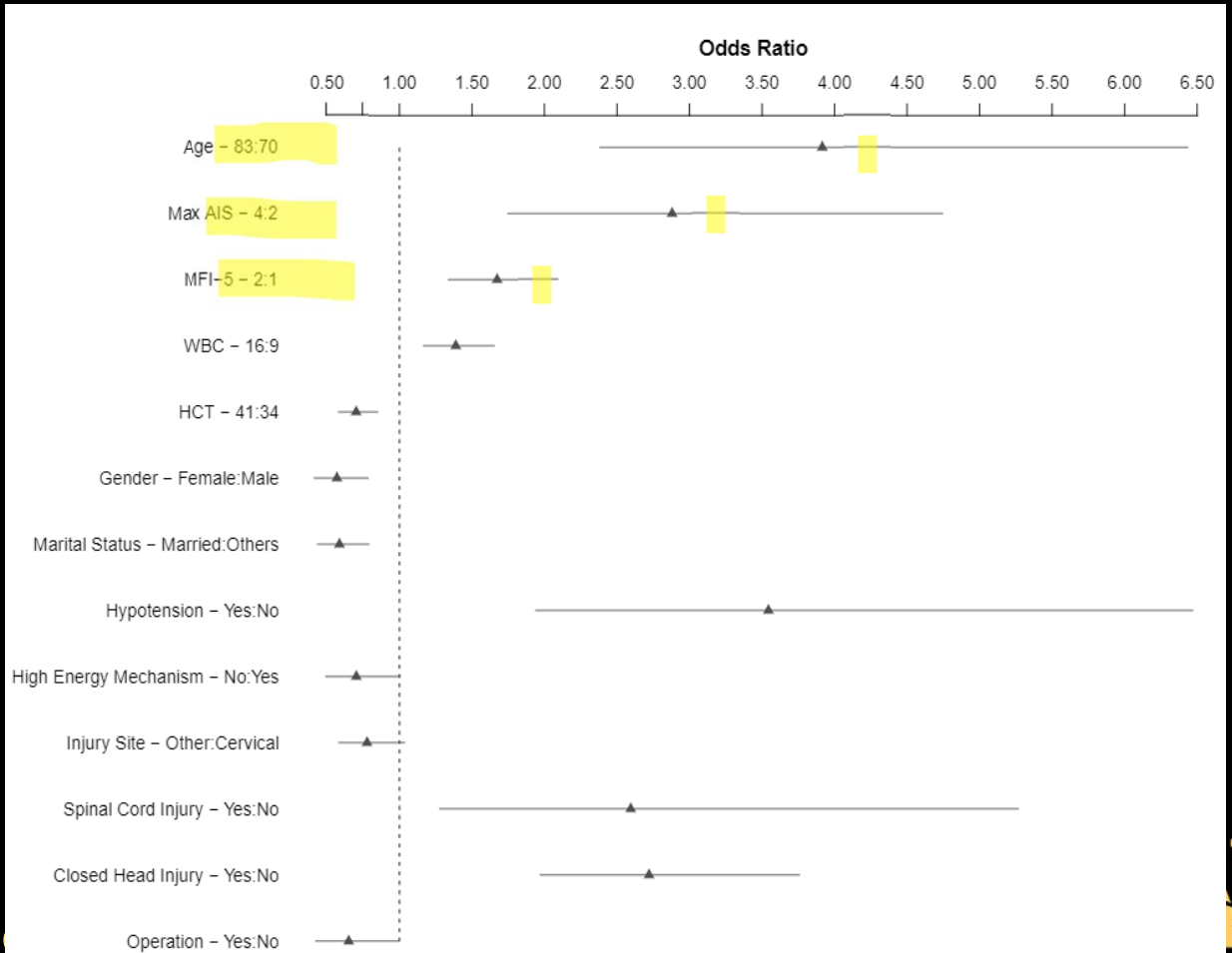
Results – Predictive Model

- Most important predictors of mortality included **age**, **MFI-5** score, and presence of **closed head injury** on presentation.

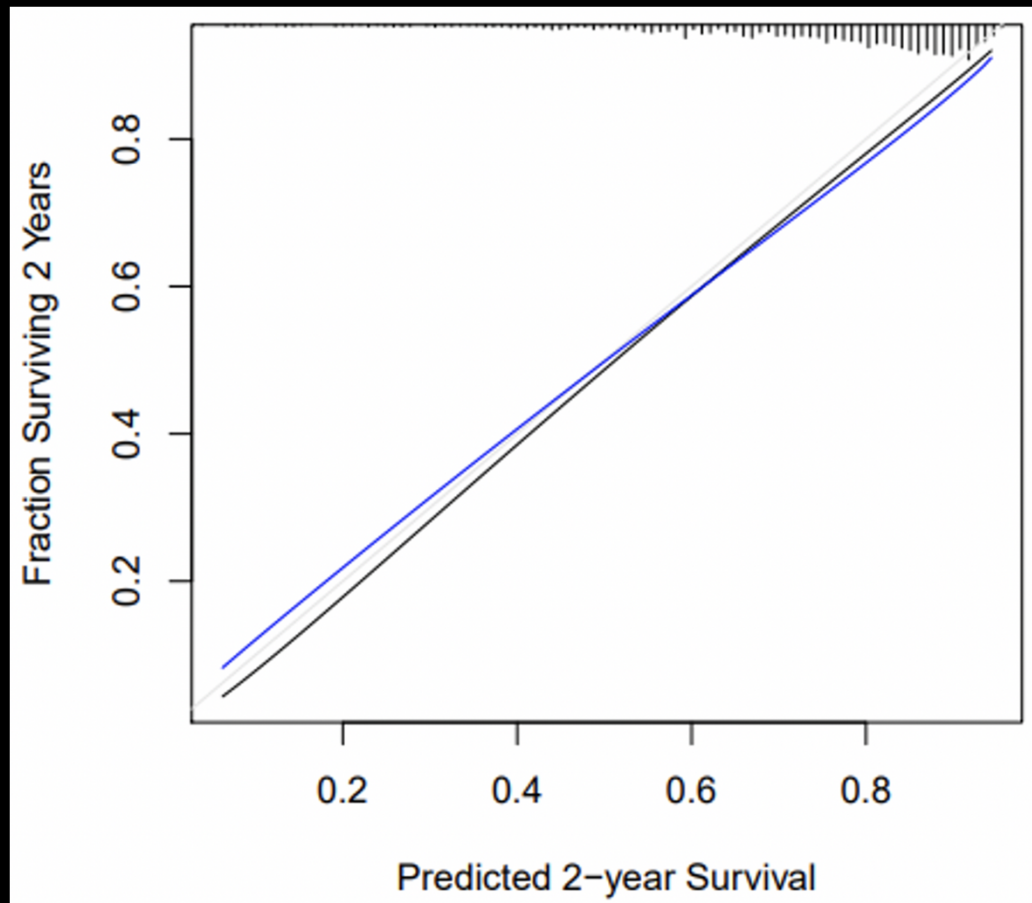


Results – Predictive Model

- The adjusted effects on 90-day mortality (OR) :
 - ✓ Age
 - ✓ Max AIS
 - ✓ MFI-5



Bootstrap : Optimism-corrected C-index of 0.77



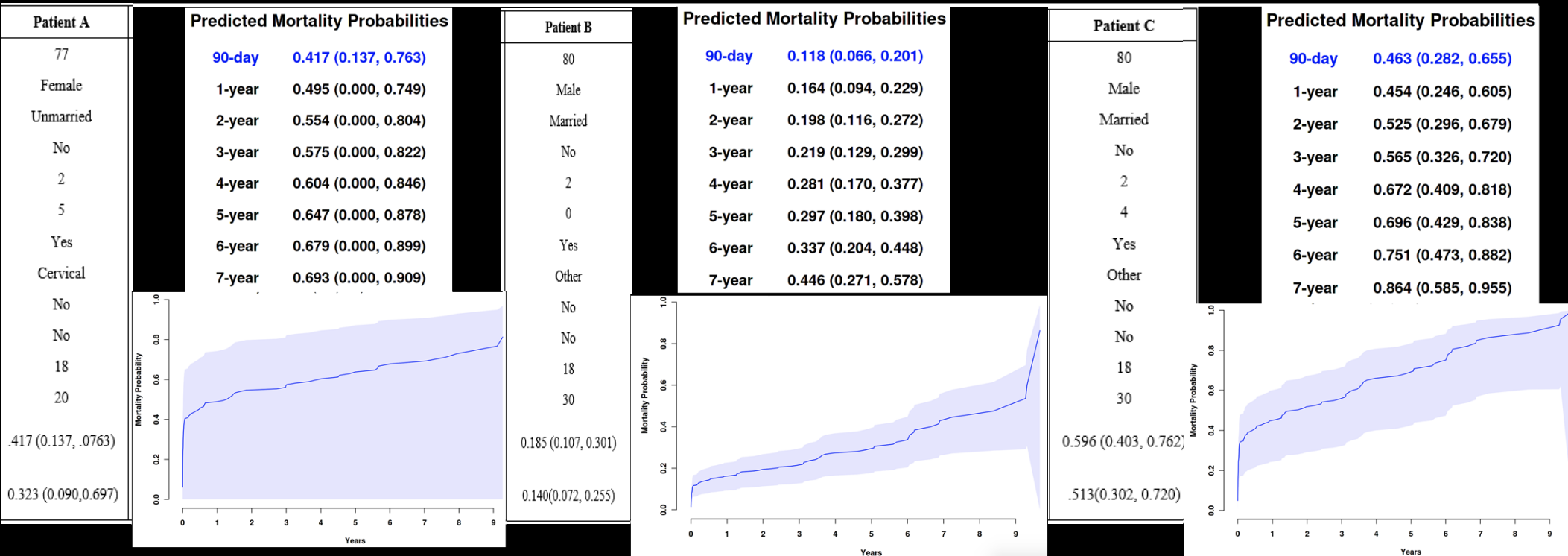
Examples :

<https://statcomp2.app.vumc.org/SpineTrauma3/>

Characteristics	Patient A	Patient B	Patient C
age	77	80	80
sex	Female	Male	Male
marital.status	Unmarried	Married	Married
hypotension.yn	No	No	No
max.ais	2	2	2
mfi.5	5	0	4
high.energy	Yes	Yes	Yes
cervical.yn	Cervical	Other	Other
spinal.injury.yn	No	No	No
head.yn	No	No	No
wbc	18	18	18
hct	20	30	30
Predicted 90-day mortality risk without surgery	.417 (0.137, .0763)	0.185 (0.107, 0.301)	0.596 (0.403, 0.762)
Predicted 90-day mortality risk with surgery	0.323 (0.090,0.697)	0.140(0.072, 0.255)	.513(0.302, 0.720)



Examples :



Discussion and Conclusions

- The population is aging.
 - ✓ More elderly patients with spine trauma
 - ✓ Changing mechanism of injury (increased low-energy mechanism)
 - ✓ Changing outcomes and mortality rates
- Physicians face difficulties regarding surgical-decision making in this population.
- This calculator hopes to provide tangible mortality risk predictions to improve evidence-based decision making and counseling of patients and families.



THANK YOU



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