

## Introduction

Survival prognosis is an important factor to consider when implementing surgical treatment for metastatic spine disease.

Several scoring systems have been developed to help providers predict survival and determine which patients with metastatic spine disease are candidates for surgery.

## Objectives/Aims

- Our primary aim was to determine predictors of 3-month, 6-month, and overall survivorship following surgery for metastatic spine disease.
- Our secondary aim was to identify the scoring system which most accurately predicts the short-term life expectancy of patients undergoing surgery for metastatic spine lesions.

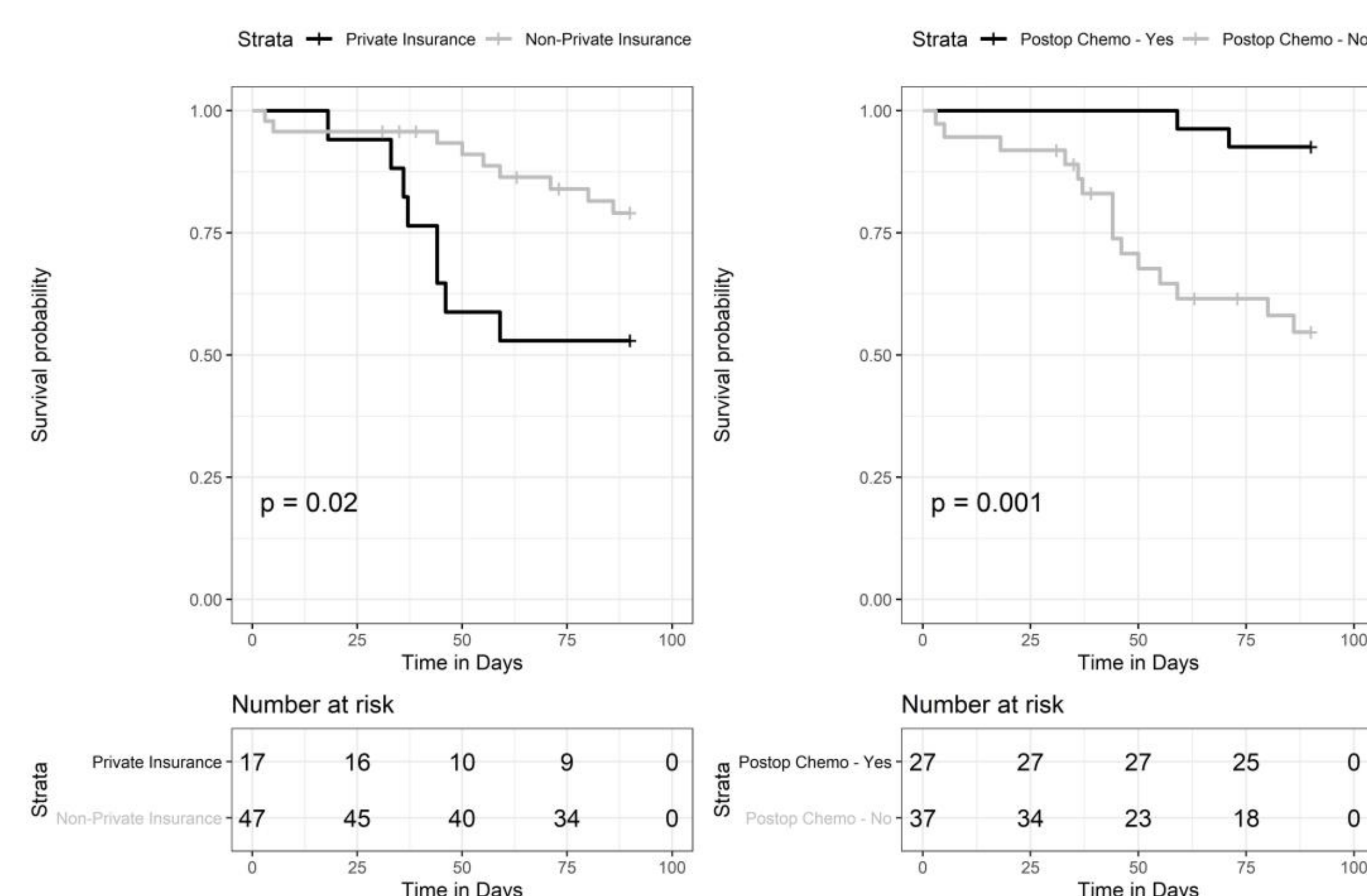
## Methods

- This was a retrospective study evaluating patients with metastatic spine disease who underwent surgery at a single academic institution between 2015 and 2021.
- Covariates of interest included gender, ethnicity, race, payor, preoperative and postoperative radiation therapy (XRT), and preoperative and postoperative chemotherapy.
- Scores were calculated using the following systems: Revised Tokuhashi, Tomita, Modified Bauer, and NESMS.
- Scores were compared with SORG 90-day survival predicting model
- We performed univariate log-rank tests to evaluate associations between binary predictors of interest and patient survival at 3 months, 6 months and final follow-up.
- The Contal and O'Quigley method was used to determine the cutoff point for a continuous variable and assess the association between risk factors of interest and overall survival.

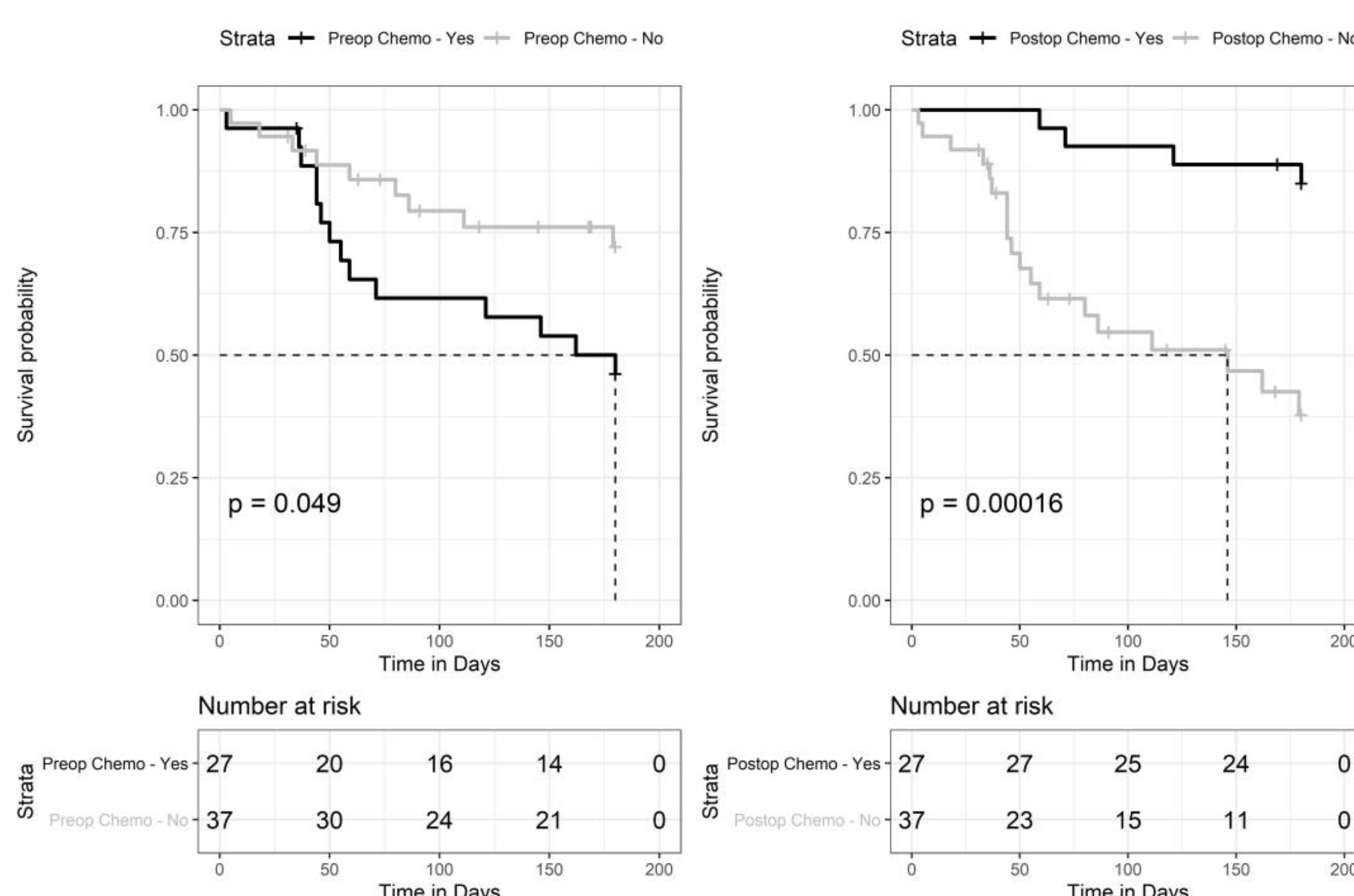
## Figures/Tables

**Table 1.** 3 - month Cutoff Population Summary.

Characteristic	Log-Rank p-value
Gender	0.6408
Ethnicity	0.3784
Race	0.5533
Payor	0.0203*
Preop XRT	0.1630
Preop Chemo	0.1262
Postop XRT	0.1049
Postop Chemo	0.0010*



**Figure 1.** 3 - month Survival.



**Figure 2.** 6 - month Survival.

**Table 2.** 6 - month Cutoff Population Summary.

Characteristic	Log-Rank p-value
Gender	0.8185
Ethnicity	0.1767
Race	0.3175
Payor	0.2095
Preop XRT	0.2936
Preop Chemo	0.0492*
Postop XRT	0.0914
Postop Chemo	0.0002*

**Table 3.** 3 - month Controlling for Payor Plan and Post-op Chemo .

Scoring System	Hazard Ratio	95% CI	p-value	Brier Score	Uno's C
Tokuhashi	0.845	0.714 1.000	0.0493*	0.202317	0.8179
Tomita	1.202	0.940 1.536	0.1424	0.207816	0.8105
Bauer	0.713	0.372 1.367	0.3078	0.209333	0.7960
NESMS	0.474	0.254 0.883	0.0187*	0.190519	0.8373
SORG – 30 Days	1.032	0.993 1.072	0.1072	0.199647	0.8071
SORG – 6 Weeks	0.972	0.953 0.991	0.0047*	0.184783	0.8179
SORG – 90 Days	0.977	0.961 0.994	0.0091*	0.182604	0.8035
SORG – 1 Year	0.986	0.964 1.009	0.2414	0.203316	0.7987

**Table 4.** 6 - month Controlling for Pre- and Post-op Chemo .

Scoring System	Hazard Ratio	95% CI	p-value	Brier Score	Uno's C
Tokuhashi	0.747	0.640 0.871	0.0002*	0.223496	0.8316
Tomita	1.375	1.128 1.677	0.0017*	0.244689	0.8116
Baur	0.493	0.298 0.816	0.0059*	0.252764	0.8016
NESMS	0.495	0.311 0.787	0.0030*	0.244092	0.8182
SORG – 30 Days	1.027	0.996 1.059	0.0864	0.270333	0.7765
SORG – 6 Weeks	0.974	0.958 0.991	0.0024*	0.256256	0.8286
SORG – 90 Days	0.977	0.964 0.991	0.0015*	0.248503	0.8082
SORG – 1 Year	0.979	0.962 0.996	0.0144*	0.25449	0.7922

## Results

In our study, 64 patients had surgery for metastatic cancer in the spine. Preoperative (p=0.0643) and postoperative chemotherapy (p =0.0002) were significant predictors for overall survival.

In the multivariable cox proportional hazard model, for every one-unit increase in scoring, the hazard rate of death decreased by 25% (Revised Tokuhashi), increased by 44% (Tomita), decreased by 53% (Modified Bauer), and decreased by 53% (NESMS). The best cut-off points for the scoring systems are 10 (Revised Tokuhashi), 5 (Tomita), 3 (Modified Bauer), and 2 (NESMS).

## Conclusions

All included models had similar efficacy for projecting survival at 3 months, 6 months, and final follow-up.

NESMS had the highest concordance value at 3 months, reflecting the best ability to discriminate between survival and non-survival. It showed the greatest consistency across the entire study period in HR of death per unit increase in score.

As such, we recommend that surgeons consider incorporating the NESMS score, and using a cutoff of 1, when counseling patients and determining whether to pursue surgical treatment of spinal metastases.

## Acknowledgements

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