

A Chest Trauma Scoring System to Predict Outcomes

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Disclosure Information

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Introduction

- Rib fractures occur in more than 10% of injured patients
- They are associated with significant morbidity and mortality:
 - Respiratory failure
 - Deep venous thrombosis
 - Pulmonary embolism

Introduction

- Several factors have been identified with blunt chest injury that have been associated with morbidity and mortality:
 - Patient age
 - Number of ribs fractured
 - Presence of bilaterality
 - Severity of pulmonary contusions

Introduction

- A scoring system for identification of patients at higher risk for morbidity and mortality may allow for prompt intervention to improve outcomes.
- Adjuncts to manage blunt chest trauma with rib fractures include:
 - Narcotic analgesia
 - Epidural analgesia
 - Intubation and mechanical ventilation
 - Early operation for rib fixation

Objective

- Previous research used a smaller cohort to create a rib fracture (RIBFX) scoring system to identify patients at greatest risk for morbidity and mortality.
- This follow-up study includes a larger cohort to delineate the significance of the previously identified scoring system with respect to mortality.

Pressley CM, et al. Predicting outcome of patients with chest wall injury.
Am J Surg. 2012 Dec; 204(6):910-3

Hypothesis

- A chest trauma score (CTS) exists to predict outcome (mortality) in blunt chest trauma patients.

Methods

- A 3-year (2009-2011) retrospective review of trauma patients (n=1361) with RIBFX's in a Level 1 Trauma Center.
- Demographics, injury severity score (ISS), presence of complications, pulmonary contusions, number of RIBFX were collected.
- CTS was calculated and used to define the patient groups used for statistical analysis.
- Univariate, Kaplan Meier Survival curves and multivariable analyses were performed for mortality.

Chest Trauma Scoring System

Age Score		
	<45	1
	45-65	2
	>65	3
Pulmonary Contusion Score		
	None	0
	Unilateral Minor	1
	Bilateral Minor	2
	Unilateral Major	3
	Bilateral Major	4
Rib Score		
	<3 Rib Fx	1
	3-5 Rib Fx	2
	>5 Rib Fx	3
Bilateral Rib Fx		
	No	0
	Yes	2

Rib Fracture Score and Mortality

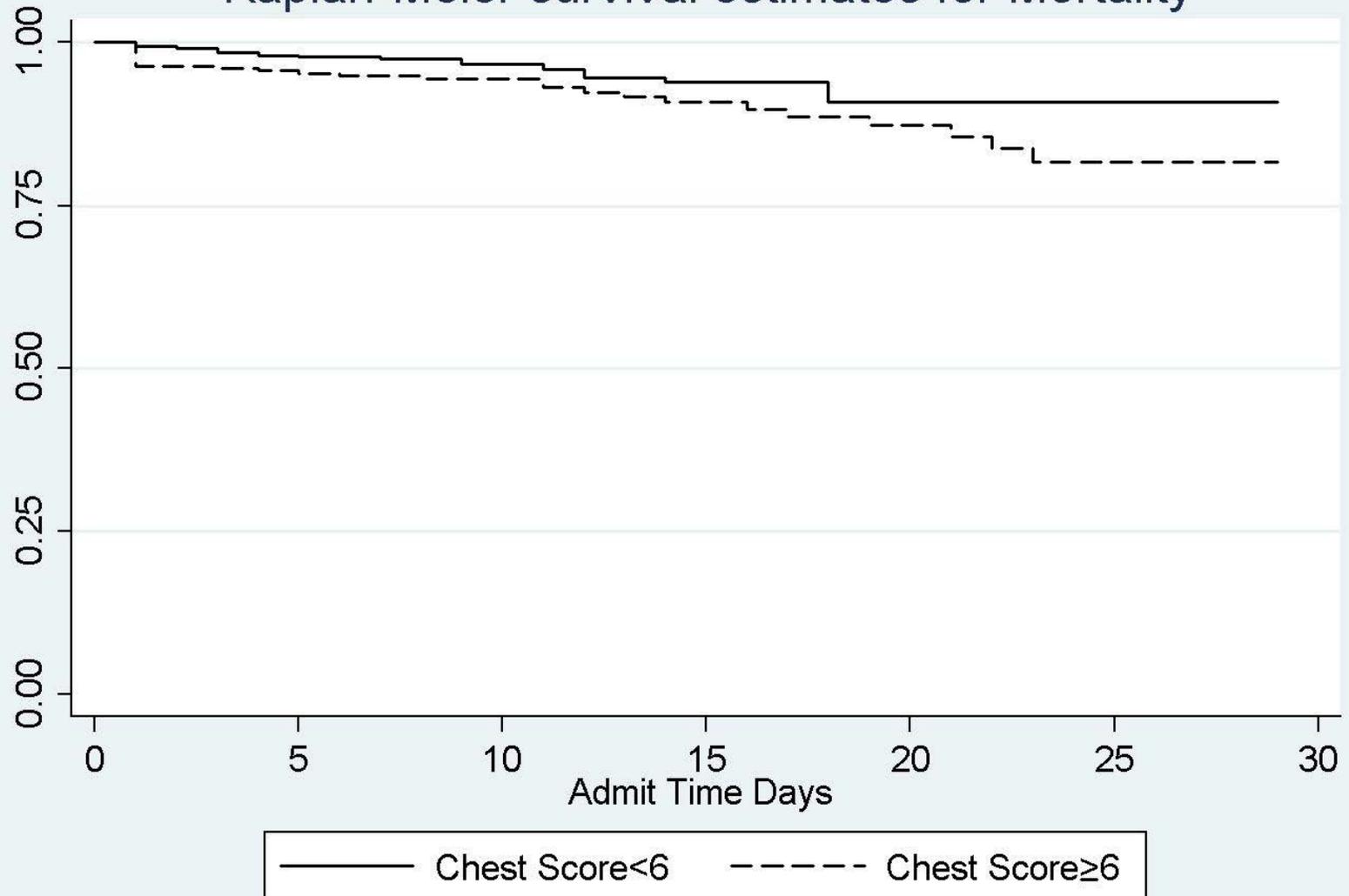
Mortality by Chest Score (total n=1361, with 73 mortality or 5.4%)

	2	3	4	5	6	7	8	9	10	11	12
Mortality %	2.3%	0.8%	3.2%	5.9%	9.0%	10.4%	15.4%	20.8%	6.3%	12.5%	0%
# patients	133	250	341	271	155	96	65	24	15	7	2

Univariate Analysis by Chest Score Breakpoint of 6 or more

	Chest Score<6 (n=995)	Chest Score≥6 (n=366)	p value
Age (mean years)	53.8+19.6	60.0+19.2	<0.001
Mortality	3.2%	11.2%	<0.001
ISS (mean)	17.1+9.8	23.3+10.1	<0.001
Pneumonia	5.0%	10.7%	<0.001
Pulmonary Embolus	1.2%	3.8%	0.002
Deep Vein Thrombosis	1.4%	1.9%	NS
Acute Resp. Failure	1.7%	5.7%	<0.001
ICU Admission	50.0%	77.1%	<0.001
Abdominal Trauma	24.6%	33.1%	0.002
ICU LOS (median)	3 IQR(1-6)	5 IQR(2-8)	<0.001
Hosp. LOS (median)	5 IQR(2-8)	8 IQR(3-11)	<0.001
AIS Chest (median)	3 IQR(2-3)	3 IQR(3-4)	<0.001
Intubated at some point	16.7%	33.9%	<0.001
Tracheostomy (n=68)	3.7%	8.5%	<0.001

Kaplan-Meier survival estimates for Mortality



Multivariable Analysis For Mortality & Chest Trauma

	Odd Ratio	p value	Confidence Interval
Injury Severity Score	1.11	<0.001	1.07-1.14
AIS Chest	0.70	0.080	0.46-1.04
AIS Abdomen	1.11	0.54	0.86-1.33
Length of Stay	0.89	<0.001	0.85-0.94
Pneumonia	3.85	0.007	1.45-10.18
Pulmonary Embolus	4.12	0.087	0.81-20.85
Deep Vein Thrombosis	0.41	0.49	0.03-5.25
Acute Respiratory Failure	3.57	0.043	1.04-12.23
ICU Admission	9.29	0.003	2.10-41.10
Tracheostomy	0.57	0.46	0.12-2.58
Chest Trauma Score*			
3	0.53	0.58	0.059-4.84
4	1.67	0.58	0.27-10.20
5	3.22	0.21	0.53-19.78
6	2.91	0.27	0.44-19.10
7	3.63	0.20	0.50-26.23
8	8.11	0.036	1.15-57.26
9	14.36	0.011	1.85-111.62
10	1.50	0.78	0.09-25.97
11	8.46	0.15	0.45-159.5
12	NS	NS	NS

***Referent: Chest Trauma Score of 2**

Conclusion

- Univariate analysis found a CTS ≥ 6 associated with *increased* mortality and morbidity including ***pneumonia, acute respiratory failure,*** and ***tracheostomy.***
- By multivariable analysis for mortality- ***CTS of 8 and 9, pneumonia,*** and ***acute respiratory failure*** were associated.
- Chest Abbreviated Injury Scale did not predict mortality while ISS was a predictor.

Limitations

- Retrospective study
- No distinction between multi-trauma patients vs. isolated blunt chest trauma
- Effects of treatment options (epidural catheters, etc.) were not analyzed
- The higher CTS groups contained fewer number of subjects, which translates into wide confidence intervals in the multivariable analysis

Further Study

- A prospective study to incorporate the Chest Trauma Score to identify vulnerable patients
- Application of scoring system to a larger population with stratified treatment arms

Questions ?



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