Comparison of Trauma Triage Scores in Predicting Poor Outcome in Trauma Patients

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INTRODUCTION

- Adequate triaging is mandatory in trauma management.

- Several trauma triage tools are available for early shock detection, need of massive blood transfusion, addressing patients to major centers and pre-alerting trauma teams.

- Many models predicting outcomes of trauma patients are unfriendly or inadequate for individual clinical management.

- **Few studies compared the prognostic performance of trauma triage tools.**

AIM TO THE STUDY

To evaluate the **discrimination power** of simple trauma **triage tools** in predicting **in-hospital mortality** in trauma patients admitted in our emergency department.

METHODS

- ***Setting***: tertiary hospital of Regione Lombardia Trauma Network ("Hub and Spoke") classified as "Centro Trauma di Zona con Neurochirurgia (CTZ con NCH)"
- ***Database***: trauma registry (Registro Trauma Manzoni, RTM) including **all trauma patients** consecutively admitted in our ER and **requiring hospital admission** since 2017
- ***Exclusion criteria*** from RTM were:
  - Patients over 65 yrs with isolated neck of femur or pubic fractures.
  - Patients with isolated distal arm or leg fractures.
  - Patients transferred from other hospitals.

TRAUMA TRIAGE TOOLS

SI

Shock Index (Allgöwer M, Burri C. Dtsch Med Wochenschr. 1967;92:1947)

Variables: HR, SBP

rSIG/A

reverse SI multiplied by Glasgow Come Scale (GCS) score and divided by age (Kimura and Tanaka Critical Care 2018;22:87)

Variables: HR, SBP, GCS, Age

NTS

new trauma score (Jeong et al. BMC Surgery 2017;17:77)

Variables: GCS, SBP, SpO2

MGAP

Mechanism, GCS, Age and Arterial Pressure score

(Sartorius et al. Crit Care Med 2010;38:831)

Variables: GCS, Age, SBP, Mechanism

MEASUREMENT OF TRAUMA TRIAGE TOOLS

SI [HR/SBP]

rSIG/A [(SBP/HR) × GCS)/Age]

NTS [(0.4006 x GCS) + (0.2983 x SBP) + (0.8709 x SpO2)]

MGAP [GCS+(code value for SBP)+(code value for blunt trauma)

+(code value for age)]

(range: 3-29)

Code values MGAP	
SBP >120 mmHg	+5
SBP 120 – 60 mmHg	+3
SBP < 60 mmHg	0
Blunt trauma (vs. penetrating)	+4
Age < 60 yrs	+5

RESULTS

- since 2017 up to 2023, 1006 trauma patients were registered in RTM
- 166 patients had missing data

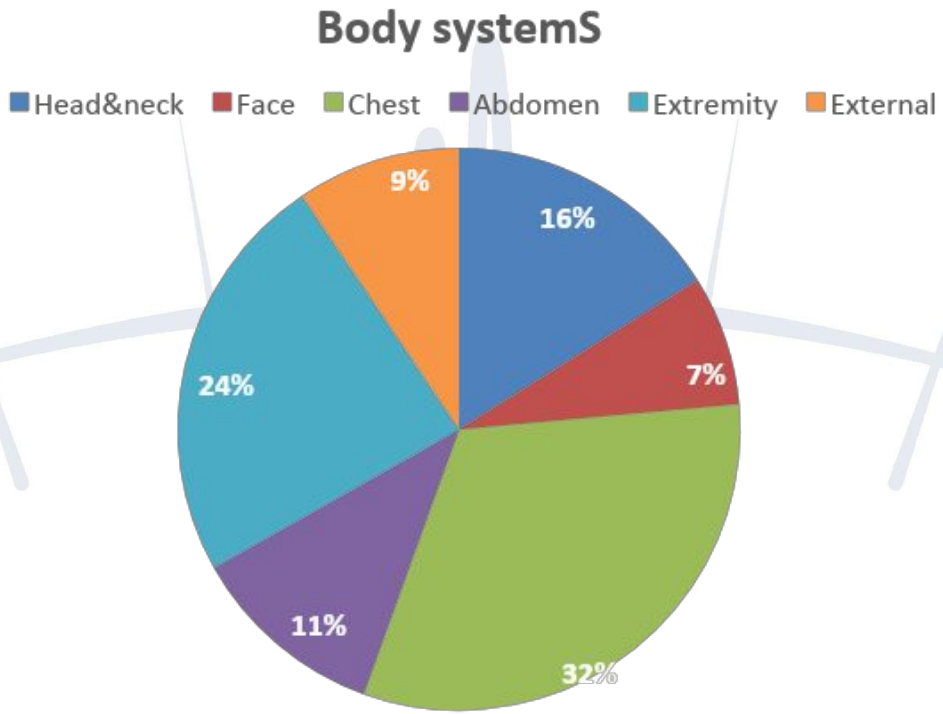
- **840 trauma patients were included in the study**

RESULTS

Characteristics		n = 840
Age (yrs)		
Sex (male)		**641 (76.3%)**
Modality of trauma	road domestic work rough environment Other	519 (62%) 151 (20%) 48 (5%) 80 (9%) 42 (4%)
Mechanism of injury (penetrating trauma)		**15 (1.8%)**
GCS (Glasgow coma scale) **(score)**		
HR (heart rate) **(bpm)**		
SBP (systolic blood pressure) **(mmHg)**		
SpO2 (peripheral arterial oxygen saturation) **(%)**		
ISS (Injury severity score) **(score)**		

Data are reported as Mean ± SD or absolute number and (%)

RESULTS – Sites of injury

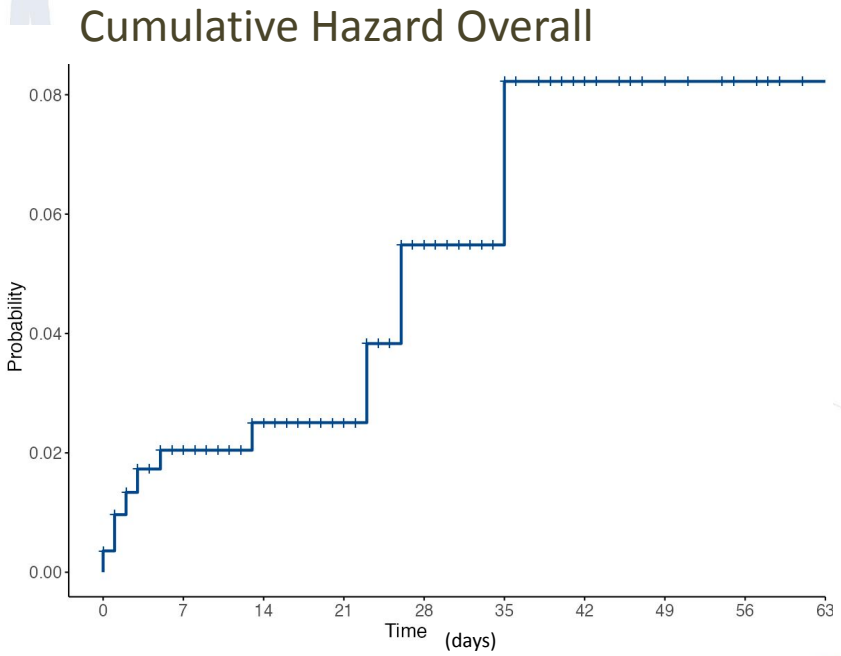


RESULTS – OUTCOMES

Outcomes	n = 840
ICU admission	263 (31.3%)
Lengh of stay (days)	
In-hospital mortality	20 (2.4%)

Survival Table

Time (days)	n. at risk	n. of events
3	768	14
14	192	3
30	49	2
40	29	1



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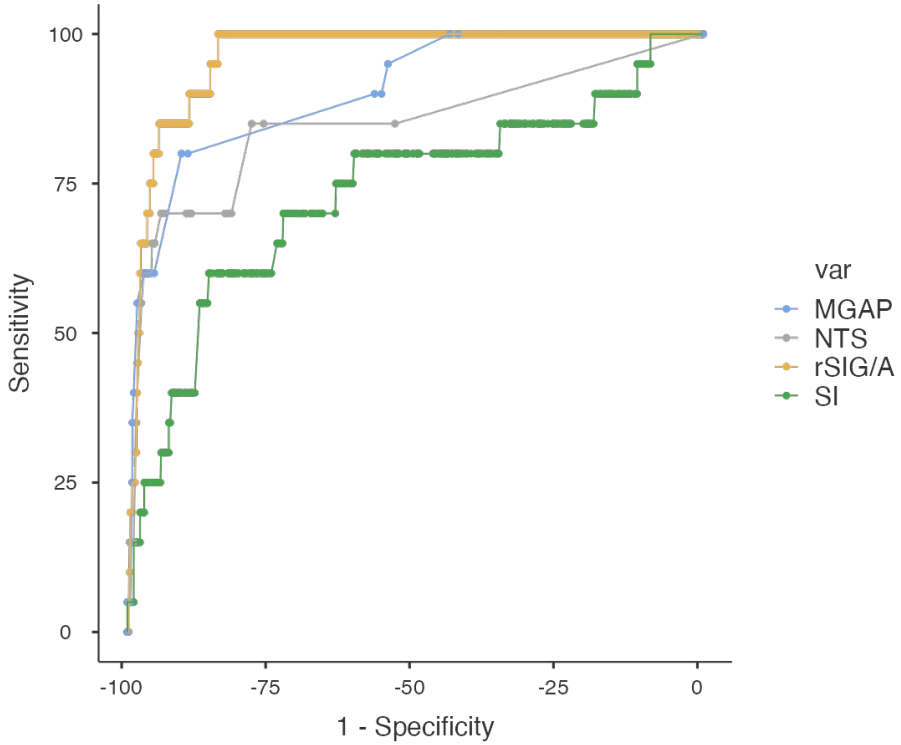
Accuracy of trauma triage tools in predicting in-hospital mortality in 840 trauma patients



Trauma triage tools	AUC#
SI	0.73
rSIG/A	**0.96***
NTS	0.85
MGAP	**0.90**

*rSIG/A
vs. SI (p=0.001)
vs. MGAP (p=0.021)
vs. NTS (p=0.037)

Area Under the Receiver Operating Characteristics Curve
* DeLong test

Standard indices of accuracy of rSIG/A in predicting in-hospital mortality in 840 trauma patients

rSIG/A	Youden's index	Sensitivity	Specificity	PPV	NPV	LH+	LH-
cut off 0.32	0.81	95%	84%	13%	99%	6.55	0.06

PPV, positive predictive values
NPV, negative predictive values
LH+, positive likelihood ratio
LH-, negative likelihood ratio

CONCLUSIONS

- **rSIG/A** and **MGAP** show adequate discrimination power to predict **in-hospital mortality** in our study trauma patients.
- The prognostic performance of rSIG/A was significantly better than other evaluated trauma triage tools .
- rSIG/A sensitivity and negative predictive values were excellent
- **rSIG/A** is a reliable tool to detect trauma patients at risk of poor short-term outcome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RESULTS – trauma triage tools

Trauma triage tools	Whole population n = 840	Alive n = 820	Dead n = 20	P value*
SI	0.63 +/- 0.18 (0.27-2.0)	0.63 +/- 0.17 (0.27-1.8)	0.85 +/- 0.36 (0.43-2.0)	<.001
rSIG/A	0.54 +/- 0.33 (0.03-3.3)	0.55 +/- 0.33 (0.03-3.3)	0.16 +/- 0.09 (0.04-3.3)	<.001
NTS	10.2 +/- 1.1 (3.8 – 10.7)	10.3 +/- 0.93 (3.8 – 10.7)	7.3 +/- 2.38 (3.8 – 10.7)	<.001
MGAP	25.9 +/- 3.6 (7-29)	26.1 +/- 3.3 (7-29)	17.4 +/- 5.7 (8-27)	<.001

Data are reported as Mean ± SD and range
* Mann-Whitney test