



Oregon is BIG: Keep Them Home?

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OHSU Trauma, Critical Care and Acute Care Surgery



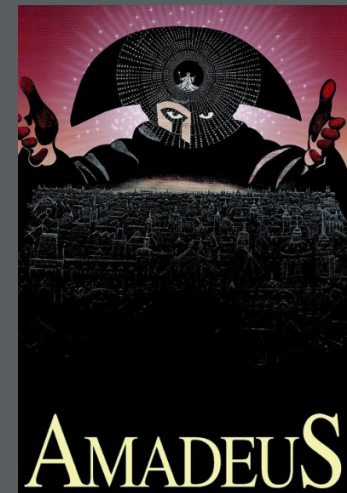


Outline

- Brain Injuries
- Catastrophically Injured Patients
- Rib Fractures

1985

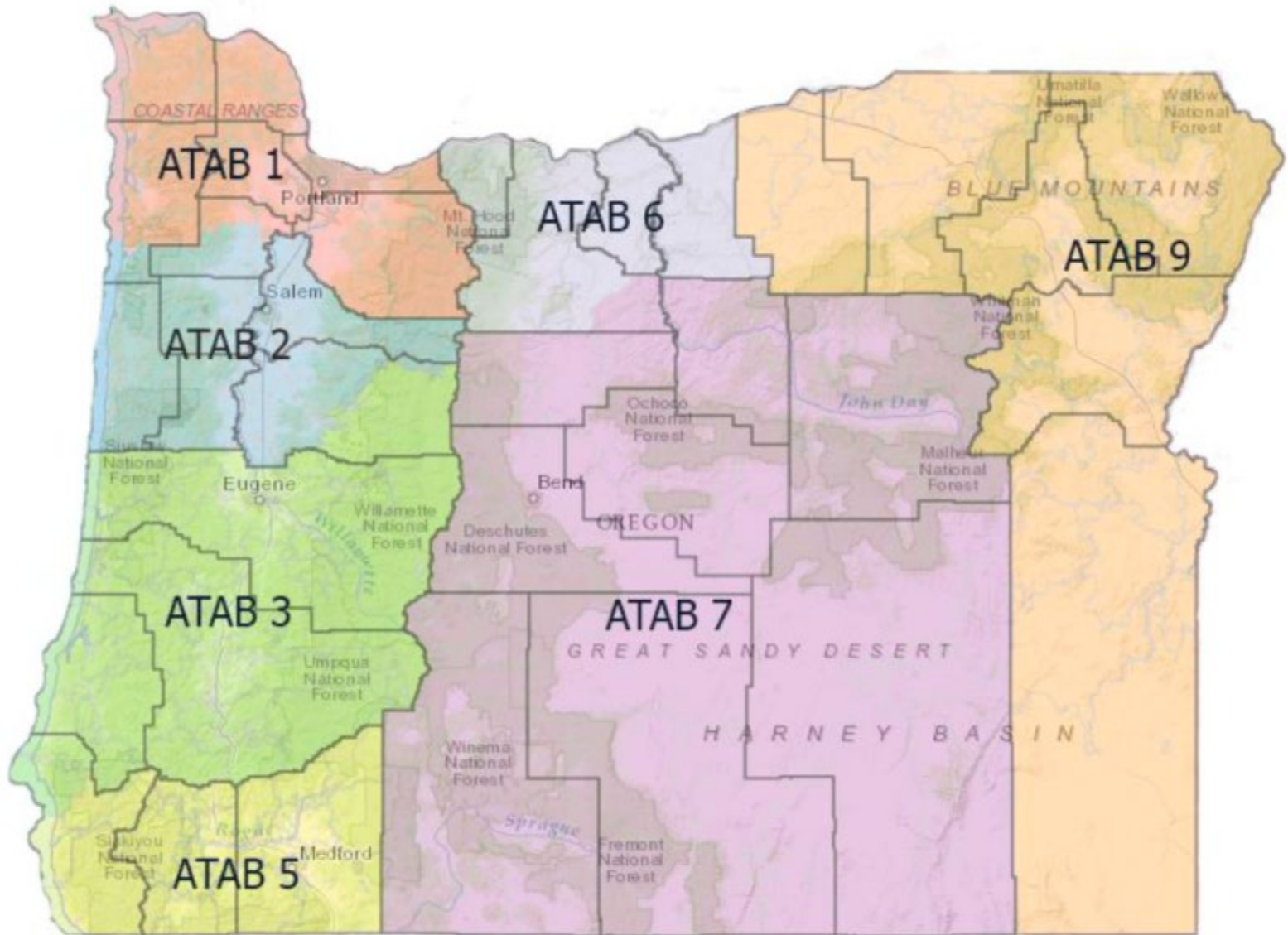
- Gorbachev takes over leadership of USSR
- Reagan starts 2nd term
- *Amadeus* wins best picture
- New Coke is introduced
- I turned 2 (!)



Oregon Trauma System

- Gov. Atiyeh signed bill in 1985, effective 1988



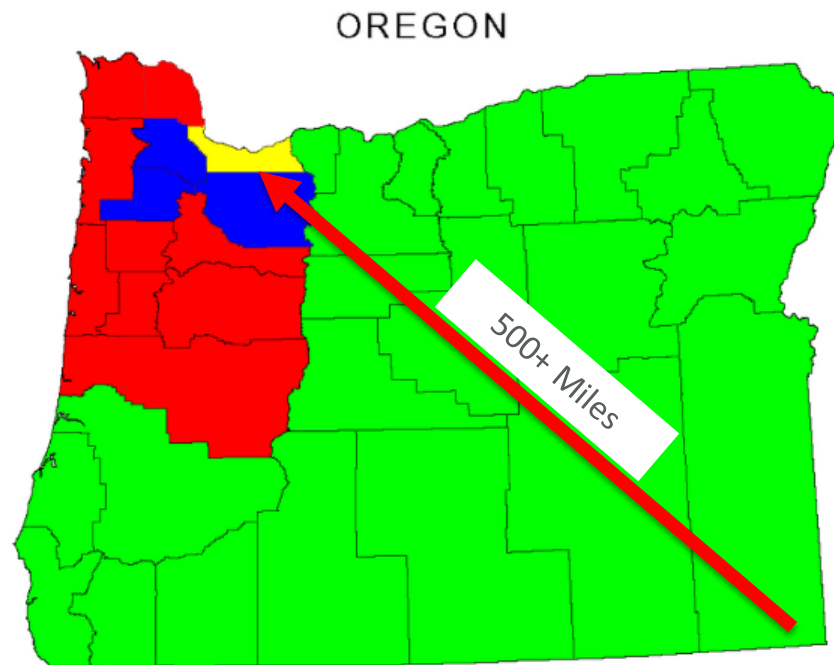


Oregon's trauma system is organized by region to manage the care of trauma patients statewide.

#Teamwork



Oregon as a Rural State



Each colorized area represents ~25% of the state of Oregon's population.

Case Scenario

- 65yo man hanging holiday lights
- Fall from ladder
- GCS 15, no anticoagulants, “trace” SAH on CT
- Presents to a level 3 trauma center



Not Necessarily

But TBIs are a “can’t miss”

What is the BIG Deal?

Brain Injury Guidelines			
Variables	BIG 1	BIG 2	BIG 3
Loss of Consciousness	Yes/No	Yes/No	Yes/No
Neurologic examination	Normal	Normal	Normal
Intoxication	No	No/Yes	Yes
Anticoagulants	No	No	Yes
Skull Fracture	No	Non-displaced	Displaced
SDH	≤ 4mm	≤ 5mm	≤ 10mm
EDH	≤ 4mm	≤ 10mm	≤ 15mm
IPH	≤ 4mm, 1 location	≤ 2mm, 2 locations	≤ 10mm, multiple locations
SAH	Trace	Localized	Scattered
IVH	No	No	Yes

The BIG (brain injury guidelines) project: Defining the
management of traumatic brain injury by acute care surgeons
ORIGINAL ARTICLE

Safety and efficacy of brain injury guidelines at a
Level III trauma center

2022 EAST QUICK SHOT

Grace E. Martin, MD,
Timothy A.
Laura B. Ngw

A multicenter validation of the modified brain injury guidelines:
Are they safe and effective?

Abid D. Khan, MD, Janet Lee, MD, Kevin Galicia, MD, Joshua D. Billings, MD, Vishal Dobarra, BS,
Purvi P. Patel, MD, Robert C. McIntyre, MD, Richard P. Gonzalez, MD, and Thomas J. Schroepel, MD,
Colorado Springs, Colorado

AAST PODIUM 2021

Validating the Brain Injury Guidelines: Results of an American Association for the Surgery of Trauma prospective multi-institutional trial

Bellal Joseph, MD, FACS, Omar Obaid, MD, Linda Dultz, MD, George Black, MD, Marc Campbell, DO, Allison E. Berndtson, MD, Todd Costantini, MD, Andrew Kerwin, MD, David Skarupa, MD, Sigrid Burruss, MD, Lauren Delgado, NP, Mario Gomez, DO, Dalier R. Mederos, MD, Robert Winfield, MD, Daniel Cullinane, MD, and the AAST BIG Multi-institutional Study Group, Tucson, Arizona



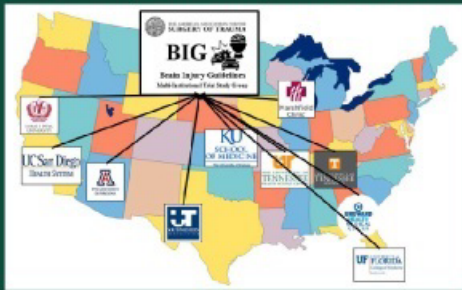
Validating The Brain Injury Guidelines: Results Of An AAST Prospective Multi-Institutional Trial

Prospective Observational
Multi-Institutional Trial
Blunt TBI & + Initial CT



N = 2,033

10 Level I & II Trauma Centers



Brain Injury Guidelines (BIG)

- Neuro Exam
- History
- CT Findings



Admission	6 hrs	24 hrs	✓
Repeat CT	✗	✗	✓
Neurosurg Consult	✗	✗	✓

No BIG 1 or 2 Pts Required
Neurosurgical Intervention



No TBI-related ED Visits or
Readmissions Among BIG1&2



Implementing BIG would have
saved 425 CT, 401 admissions
& 511 NS Consults



Joseph et al. *Journal of Trauma and Acute Care Surgery*.
Month 2021 [doi]

@JTraumAcuteSurg

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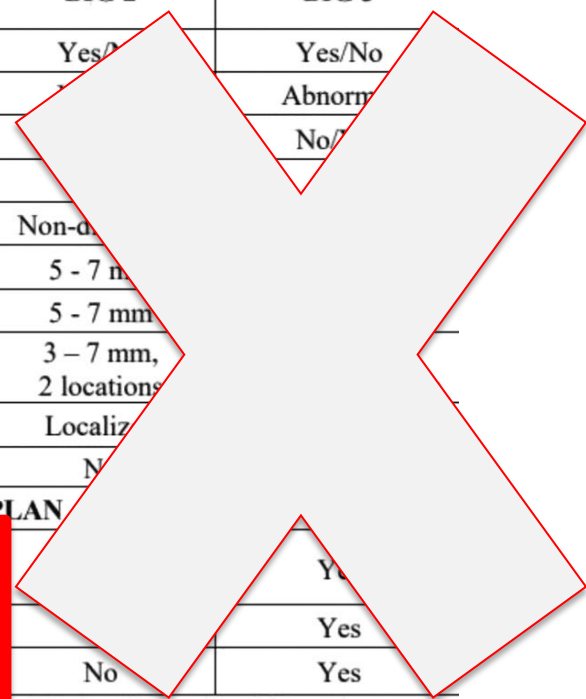
The Journal of
**Trauma and
Acute Care Surgery®**



No repeat CT, No Neurosurg.

Brain Injury Guidelines			
Variables	BIG 1	BIG 2	BIG 3
LOC	Yes/No	Yes/No	Yes/No
Neurologic examination	Normal	Abnorm	Abnorm
Intoxication	No	No	No
CAMP	No	No	No
Skull Fracture	No	Non-d	Non-d
SDH	≤ 4mm	5 - 7 mm	5 - 7 mm
EDH	≤ 4mm	5 - 7 mm	5 - 7 mm
IPH	≤ 4mm, 1 location	3 - 7 mm, 2 locations	3 - 7 mm, 2 locations
SAH	Trace	Localiz	Localiz
IVH	No	No	No
THERAPEUTIC PLAN			
Hospitalization	No Observation (6hrs)	No	Yes
RHCT	No	No	Yes
NSC	No	No	Yes

BIG, brain injury guidelines; CAMP, Coumadin, Aspirin, Plavix; EDH, epidural hemorrhage; IVH, intraventricular hemorrhage; IPH, intraparenchymal hemorrhage; LOC, loss of consciousness; NSC, neurosurgical consultation; RHCT, repeat head computed tomography; SAH, subarachnoid hemorrhage; SDH, subdural hemorrhage



BIG 1: No Deterioration

TABLE 3 - Analysis of Study Outcome Measures Among the Patient Cohort

	BIG 1 (n = 301)	BIG 2 (n = 171)	BIG 3 (n = 177)
Neurologic examination deterioration, n (%)	Nil	2 (1.2)	5 (2.8)
Progression of hemorrhage on RHCT, n (%)	4 (1.3)	21 (12.3)	39 (21.6)
Neurosurgical intervention, n (%)	Nil	Nil	35 (19.5)
Postdischarge ED visit, n (%)	13 (4.3)	1 (0.6)	12 (6.8)
30-d Readmissions, n (%)	1 (0.3)	6 (3.5)	85 (47.9)

JOURNAL OF TRAUMA AND ACUTE CARE SURGERY

ATAB 1 Trauma Triage Policy

BIG 1 TBIs CAN be managed *In Situ*

NEW
STAB Guidance

BIG 1 TBIs CAN be managed *In Situ*

Where Did the <0.13% Come From?

- Joseph et al. 2022.
 - 301 BIG 1 patients, 0 required neurosurgical intervention
- Joseph et al. 2014 (Apr)
 - 121 BIG 1 patients, 0 required neurosurgical intervention
- Martin et al. 2018
 - 115 BIG 1 patients, 0 required neurosurgical intervention
- Joseph et al. 2014 (Dec)
 - 254 BIG 1 patients, 0 required neurosurgical intervention

Why Do We Care?

- Patient Risk
- Financial Toxicity
- Hospital Capacity

INDEPENDENT SUBMISSION

Financial toxicity after trauma and acute care surgery: From understanding to action

John W. Scott, MD, MPH, Lisa Marie Knowlton, MD, MPH, Patrick Murphy, MD, MPH, MSc,
Pooja U. Neiman, MD, MPA, R. Shayn Martin, MD, MBA, Kristan Staudenmayer, MD, MS,
and on behalf of the AAST Health Economics Committee, Ann Arbor, Michigan



HHS Public Access

Author manuscript

J Trauma Acute Care Surg. Author manuscript; available in PMC 2020 November 01.

Published in final edited form as:

J Trauma Acute Care Surg. 2019 November ; 87(5): 1189–1196. doi:10.1097/TA.0000000000002409.

Financial Toxicity Is Associated With Worse Physical and Emotional Long-term Outcomes After Traumatic Injury



Bottom Lines

- BIG 1 TBIs #never progress
 - Actual number is $<1/791$ ($<0.13\%$)
- BIG1 stratification can be done by you + Rads
- Transfer is ***OPTIONAL***

What About the Devastating / Non-survivable Injuries?

Futile Trauma Transfers:

An Infrequent but Costly Component of Regionalized Trauma Care

Study Population

Trauma transfers to KUMC from 2017-2019 with admission < 48 hours with no major surgical, endoscopic, or radiologic intervention.

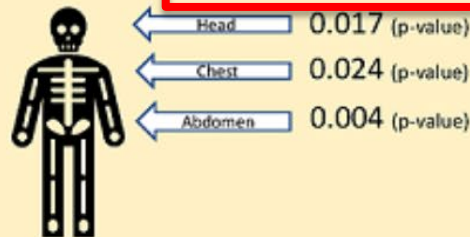
Futility = death or hospice within 48 hours



Study Results

Futile patients = 1.5% of transfer population

AIS Futile vs. Non-Futile



Futile patients = older more severely injured patients with injuries to head and torso

Conclusion

Median cost of futile transfers = \$56,396

Total cost > \$1.7 million



1.5% of 33,000 annual trauma transfers in U.S.

Total spend > \$27,000,000

What is the true cost of futile trauma transfer? Rethinking the transfer paradigm.

Follette et al.
EAST Annual Scientific Assembly
January 2021

@EAST_Trauma
@Ku_trauma
@KU_Surgery
@KuSurgery



Eastern Association for the Surgery of Trauma
Advancing Science, Fostering Relationships, and Building Careers





Shocking



80% of trauma transfers to OHSU who DIED within 48 hours had NO Discussion of GOALS prior to transfer!

The Journal of Trauma and Acute Care Surgery

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ORIGINAL ARTICLE

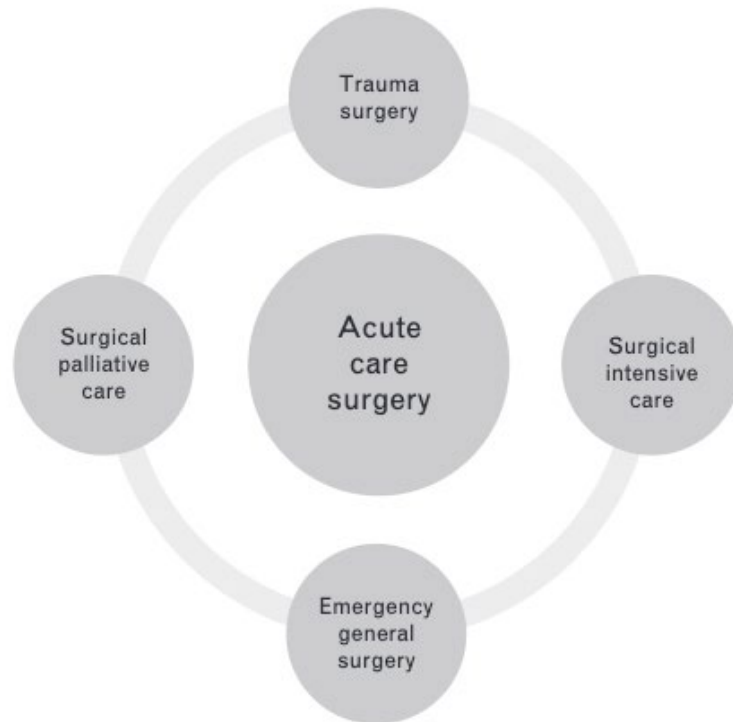
GOALS OF CARE ARE RARELY DISCUSSED PRIOR TO POTENTIALLY FUTILE TRAUMA TRANSFER: IS IT OKAY TO SAY “NO”?

Trenga-Schein, Nellie BA; Zonies, David M.D., M.P.H., M.B.A., F.A.C.S., F.C.C.M., F.A.C.H.E.; Cook, Mackenzie M.D., F.A.C.S

[Author Information](#) ☺

Journal of Trauma and Acute Care Surgery ():10.1097/TA.0000000000004215, November 20, 2023. | DOI: 10.1097/TA.0000000000004215

Palliative Care is Trauma Care



ATLS 11th Ed.
will have Palliative
Care

O'Connell and Maier. 2016

Bottom Lines

- This is VERY Complex
- Ask about Goals of Care

We WILL SUPPORT YOU!

Case Scenario

- 65yo man hanging holiday lights
- Fall from ladder
- 4 rib fractures on the right, no TBI



Not Necessarily

****But avoid late decline****

0022-5282/00/4806-1040

The Journal of Trauma: Injury, Infection, and Critical Care
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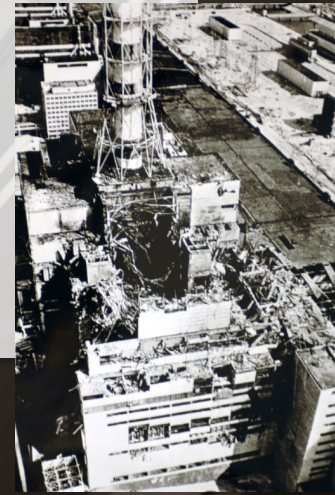
Vol. 48, No. 6
Printed in the U.S.A.

Rib Fractures in the Elderly

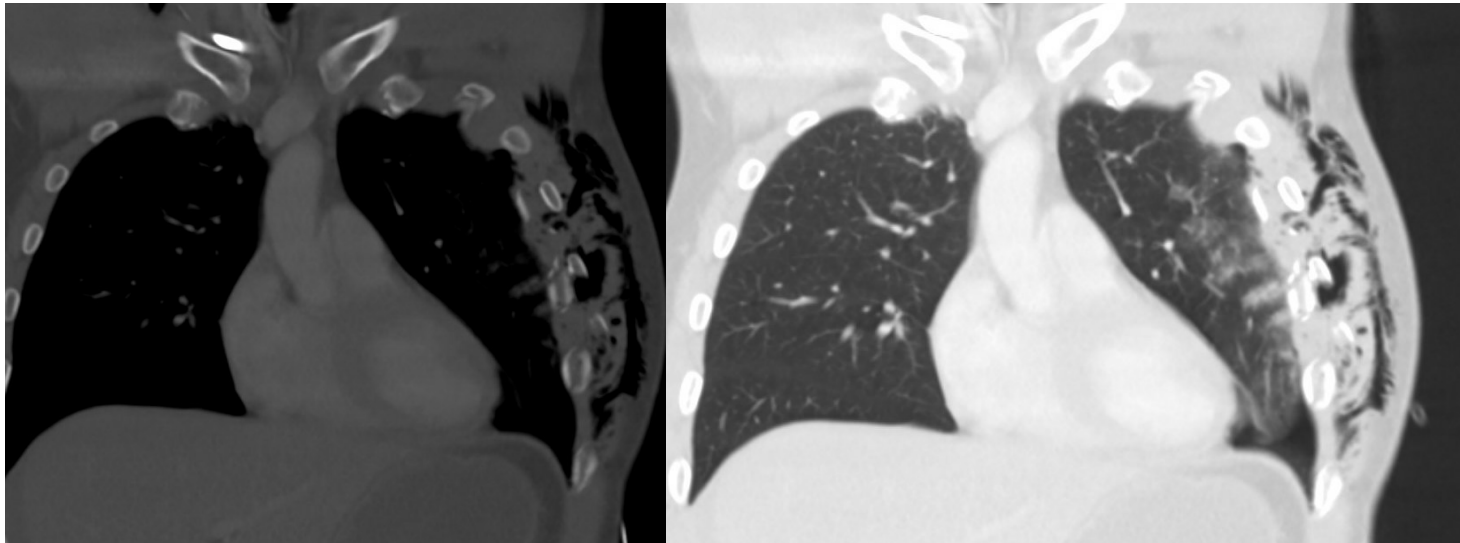
Eileen M. Bulger, MD, Matthew A. Arneson, MD, Charles N. Mock, MD, PhD, and Gregory J. Jurkovich, MD



Devil in the Details

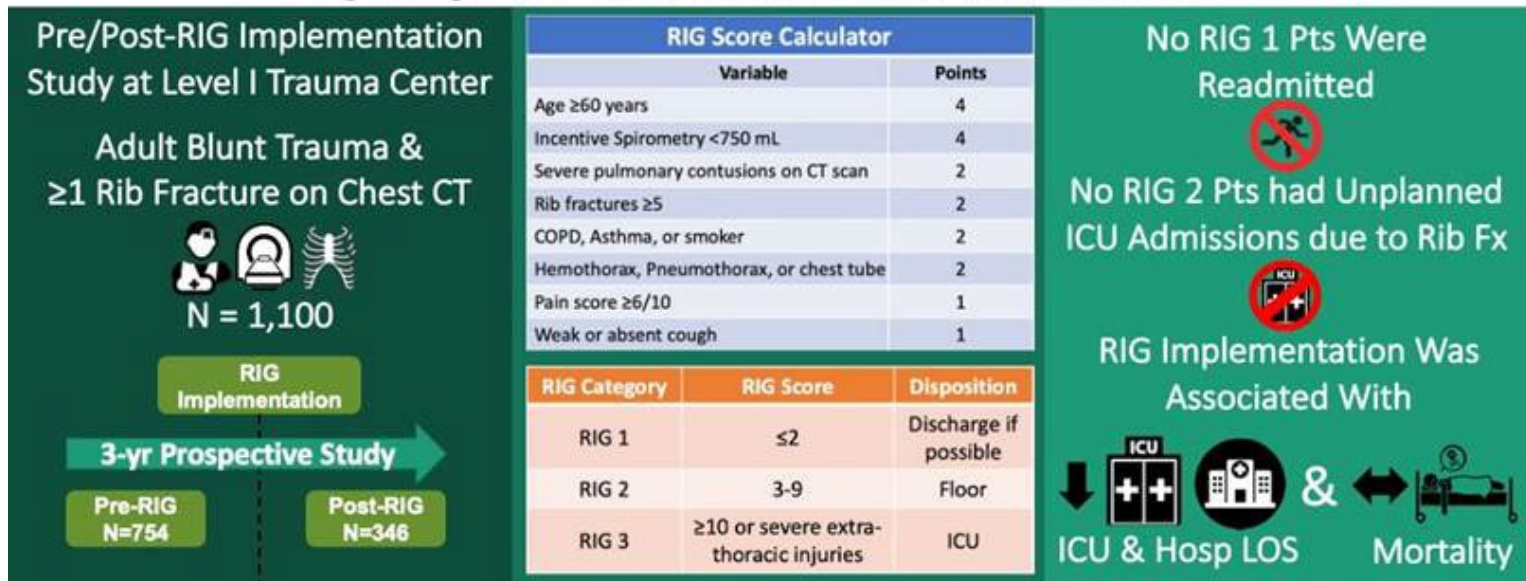


These Need to Come



Physiology!

Prospective Validation of The Rib Injury Guidelines (RIG) For Traumatic Rib Fractures



Nelson et al. *Journal of Trauma and Acute Care Surgery*.
June 2022 [10.1097/TA.0000000000003535]

@JTraumAcuteSurg

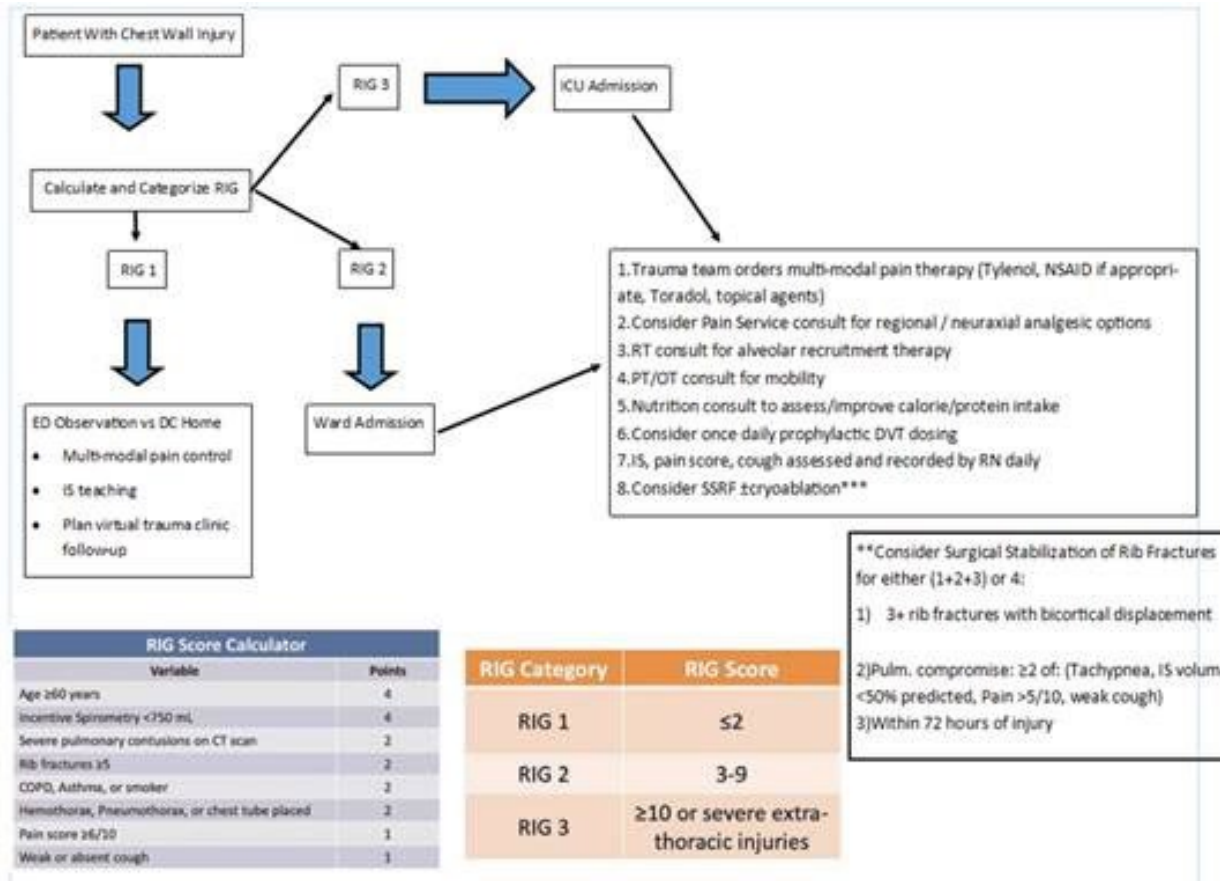
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The Journal of
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RIG Score Calculator	
Variable	Points
Age \geq 60 years	4
Incentive Spirometry <750 mL	4
Severe pulmonary contusions on CT scan	2
Rib fractures \geq 5	2
COPD, Asthma, or smoker	2
Hemothorax, Pneumothorax, or chest tube placed	2
Pain score \geq 6/10	1
Weak or absent cough	1

RIG Category	RIG Score	Disposition
RIG 1	\leq 2	Discharge if possible
RIG 2	3-9	Floor
RIG 3	\geq 10 or severe extra-thoracic injuries	ICU

Changing Practice



RIG Score Calculator	
Variable	Points
Age ≥60 years	4
Incentive Spirometry <150 ml	4
Severe pulmonary contusions on CT scan	2
Rib fractures ≥5	2
COPD, Asthma, or smoker	2
Hemothorax, Pneumothorax, or chest tube placed	2
Pain score ≥6/10	1
Weak or absent cough	1

RIG Category	RIG Score
RIG 1	≤2
RIG 2	3-9
RIG 3	≥10 or severe extra-thoracic injuries

July 30, 2021

ATAB 1 Trauma Triage Policy

Trauma and non-trauma hospitals within ATAB 1 may manage the following injuries in situ:

General Surgery (for hospitals that have critical care capabilities)

- Isolated Grade 1 or 2 spleen or liver lacerations without extraluminal contrast or abnormal hemodynamics
- Fewer than 4 unilateral rib fractures in patients < 66 years

When managing patients with these injuries, hospitals are encouraged to contact a Level 1 trauma center for consultation:

OHSU: 503-494-7000

Emanuel: 503-413-2175

Bottom Lines

- We should transition to physiologic focused risk stratification of rib fractures
- RIG guidelines provide a shared language
- Transfer is NOT mandatory

What Can You Do?

- Work with radiology to add BIG stratification to TBI reads
- Support plans to reconsider BIG1 / RIG1 transfers
- Ask about goals of care in the catastrophically injured



Thank You