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WHAT YOU NEED TO KNOW MULTIPLE ORGAN FAILURE

MULTIPLE ORGAN FAILURE: WHAT YOU NEED TO KNOW
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WHAT YOU NEED TO KNOW DIAGNOSIS AND MANAGEMENT OF ACUTE KIDNEY INJURY IN THE ACUTE CARE SURGERY PATIENT

ACUTE KIDNEY INJURY IN THE ACUTE CARE SURGERY PATIENT: WHAT YOU NEED TO KNOW
[HTTPS://JOURNALS.LWW.COM/JTRAUMA/FULLTEXT/2024/12000/ACUTE_KIDNEY_INJURY_IN_THE_ACUTE_CARE_SURGERY.2.ASPX](https://journals.lww.com/jtrauma/fulltext/2024/12000/acute_kidney_injury_in_the_acute_care_surgery.2.aspx)

Comparison of thoracic epidural catheter and continuous peripheral infusion for management of traumatic rib fracture pain

Poor pain control drives negative outcomes in traumatic rib fractures

Do thoracic epidural catheters (TECs) provide superior pain control compared to ketamine and/or lidocaine infusions (Drip)?

Single level 1 trauma center, retrospective analysis

n=1647
TEC only: n = 248
Drip only: n= 1399

TEC associated with:

- Daily MME use (→ MME daily difference on hospital days 3 & 4)
- Mean pain scores (1.23 X higher MPS with Drip only)

Consider TEC analgesia in chest wall injury pain control

Beyene R et al. Journal of Trauma and Acute Care Surgery. DOI: 10.1097/TA.0000000000004445
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COMPARISON OF THORACIC EPIDURAL CATHETER AND CONTINUOUS PERIPHERAL INFUSION FOR MANAGEMENT OF TRAUMATIC RIB FRACTURE PAIN
[HTTPS://JOURNALS.LWW.COM/JTRAUMA/FULLTEXT/2024/12000/COMPARISON_OF_THORACIC_EPIDURAL_CATHETER_AND_3.ASPX](https://journals.lww.com/jtrauma/fulltext/2024/12000/comparison_of_thoracic_epidural_catheter_and_3.aspx)

Ouch, that hurts!! Are we adequately assessing rib fracture pain for hospitalized patients?

Background

Chest Wall Movement → Ouch!

Movement aversion impairs pulmonary hygiene

Increased rib pulmonary complications

1. Chest wall movement increases pain reported with rib fracture

2. Dynamic survey reveals differences in pain before/after Surgical Stabilization of Rib Fracture (SSRF)

Methods

Observational study
Single-center
Study Group: 1+ Rib Fracture Admits

102 Rib Fracture Patients
95.1 with local-regional analgesia

Median LOS: 7d
102
43 59

Dynamic survey reveals:

1. Significant increase in pain scores with movement
2. Improvements in all measures (pain scores, IS, dicking/jumping, narcotic requirement) following SSRF

Bauman ZM et al. Journal of Trauma and Acute Care Surgery. DOI: 10.1097/TA.0000000000004446
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IT DOESN'T HURT AS LONG AS I DON'T MOVE: ALIGNING PAIN ASSESSMENT IN PATIENTS WITH RIB FRACTURES WITH MOBILIZATION NEEDED FOR RECOVERY
[HTTPS://JOURNALS.LWW.COM/JTRAUMA/ABSTRACT/2024/12000/IT_DOESN_T_HURT_AS_LONG_AS_I_DON_T_MOVE_ALIGNING.4.ASPX](https://journals.lww.com/jtrauma/abstract/2024/12000/it_doesn_t_hurt_as_long_as_i_don_t_move_aligning.4.aspx)

Whole Blood versus Balanced Resuscitation in Massive Hemorrhage: Six of One or Half Dozen of the Other?

Study Population	Results	Conclusions
Retrospective study (2016–2021) Trauma patients 15+ years ≥ 3 units WB or RBCs 1 st hour (CAT+)	Mortality 24-hour: 18% 30-day: 32%	Whole blood-based and balanced component-based resuscitation were associated with similar 24-hour and 30-day mortality rates.
350 Patients 180 Whole Blood vs. 170 Balanced Component	WB Component P-value 15% p=0.5 31% p=0.5	WB resuscitation resulted in balanced resuscitation at all times, while CO required adept attention to ratios of products administered.

Barton CA et al. Journal of Trauma and Acute Care Surgery. DOI: 10.1097/TA.0000000000004366
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WHOLE BLOOD VERSUS BALANCED RESUSCITATION IN MASSIVE HEMORRHAGE: SIX OF ONE OR HALF DOZEN OF THE OTHER?
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Mechanism Matters: Differential Benefits of Cold-Stored Whole Blood for Trauma Resuscitation from a Prospective Multicenter Study

Trauma Patients (n=1616)	Results	Conclusions
Penetrating (53%) Blunt (47%)	Decreased Overall and Interval Mortality with LTOWB (Overall and Interval) (p < 0.05)	LTOWB Improves Survival Following Penetrating Trauma
LTOWB vs. BCT	LTOWB = BCT (No difference in mortality)	

Dillard J et al. Journal of Trauma and Acute Care Surgery. DOI: 10.1097/TA.0000000000004353
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MECHANISM MATTERS: DIFFERENTIAL BENEFITS OF COLD-STORED WHOLE BLOOD FOR TRAUMA RESUSCITATION FROM A PROSPECTIVE MULTICENTER STUDY
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Surgical Management of Costal Margin Rupture Associated with Intercostal Hernia: Evolution of Techniques

Costal Margin Rupture with Intercostal Hernia:
Rare and challenging surgery with a high reoperation rate

Sheffield Classification
Surgical repair in 25 cases of CMR-IH or TDIH, with 6 reoperations in 5 patients

Evolution of techniques, driven by failures, from suture repair through external mesh repair to Mk 3 Double Layer Mesh Repair

Mk 3 Double Layer Mesh Repair, with Rib Buttress Plates, is successful

Collaboration needed to determine optimal management

Edwards JG et al. Journal of Trauma and Acute Care Surgery. DOI: 10.1097/TA.0000000000004440
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SURGICAL MANAGEMENT OF COSTAL MARGIN RUPTURE ASSOCIATED WITH INTERCOSTAL HERNIA: EVOLUTION OF TECHNIQUES
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Anatomy of the Interchondral Joints and the Effects on Mobility of Ribs

Traditional Chest Wall Anatomy Teaching: Common costal cartilage between ribs 7-10

Additionally, the effects of intrachondral joints on the mobility of ribs is not well understood.

28 Cadavers

Interchondral Joints

- Ribs 5/6: 35%
- Ribs 6/7: 96%
- Ribs 7/8: 96%

Free Tips
8th Rib: 58%
9th Rib: 92%

Floating Rib
10th Rib: 46%

Upward pressure on the 10th rib was transmitted by intrachondral joint up the rib cage.

Bridging interchondral joints are common between ribs 5-8 and participate in distributing forces from the costal margin across the chest wall. Upward forces at the costal margin are transmitted across the lower rib cage and result in increased mobility of the lower half of the ribs. The 8th/9th ribs often have mobile tips and the 10th is often a floating rib.

Eriksson EA et al. Journal of Trauma and Acute Care Surgery. DOI: 10.1097/TA.0000000000004430
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ANATOMY OF THE INTERCHONDRAL JOINTS AND THE EFFECTS ON MOBILITY OF RIBS
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When More Is More: Utilizing Finite Element Analysis To Assess Chest Wall Injury Stability After Surgical Stabilization Of All Rib Fractures Versus Only A Portion Of The Rib Fractures

Background

Surgical Stabilization of Rib Fractures (SSRF)

Controversy over number of ribs to stabilize

Reliable

Reproducible

Finite Element Analysis Modeling

No good chest wall models

Methods

Assessment Criteria for Chest Wall Stability

- Normalized mean absolute error
- Normalized root mean square error
- Normalized interframe respiratory motion

Factors

- Right Bending
- Right Twisting
- Left Axial Rotation
- Right Axial Rotation
- Arm Lifting

Results + Discussion

Up to 50% loss chest wall stability when no fractures stabilized

When all fractures stabilized, chest wall stability almost back to intact state

When half fractures stabilized, chest wall instability still remains significant

****Stabilizing all rib fractures when possible allows for best chest wall stability****

Bauman ZM et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004450

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WHEN MORE IS MORE: UTILIZING FINITE ELEMENT ANALYSIS TO ASSESS CHEST WALL INJURY STABILITY AFTER SURGICAL STABILIZATION OF ALL RIB FRACTURES VERSUS ONLY A PORTION OF THE RIB FRACTURES

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Incorporating a Parallel Quality and Safety Program for Surgical Stabilization of Rib Fractures

Trauma PI Coordinators

Abstract Data and Outcomes Parallel PI Process

Trauma Outcomes

SSRF Outcomes

Specific to SSRF Procedure and Outcomes

Discussed at Trauma M&M

SSRF Specific Changes

Bi-Monthly SSRF M&M Conference

Regional Evaluation of SSRF Needs and SSRF Clinic Creation

Xray Prior to Leaving OR

- Complications
- Demographics
- Indications
- Fracture Patterns
- Anonymous Surgeon Outcomes
- Plating System Utilized

Sanderfer VC et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004449

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DEDICATED CHEST WALL INJURY PROGRAM QUALITY REVIEW: HOW TO CREATE AND INCORPORATE A QUALITY AND SAFETY PROGRAM FOR SURGICAL STABILIZATION OF RIB FRACTURES

[HTTPS://JOURNALS.LWW.COM/JTRAUMA/ABSTRACT/2024/12000/DEDICATED_CHEST_WALL_INJURY_PROGRAM_QUALITY.8.ASPX](https://journals.lww.com/jtrauma/abstract/2024/12000/dedicated_chest_wall_injury_program_quality.8.aspx)

Platelet Rich Plasma Enhances Rib Fracture Strength and Callus Formation In Vivo

Rat blood was collected and pooled to make PRP. Rat ribs were fractured and PRP or saline was administered to the rib at the time fracture.

Ribs were assessed at 2 & 6 weeks radiographically, histologically, and mechanically.

PRP treated ribs demonstrated improved cellular recruitment and endochondral ossification, suggesting the role that PRP could play in the treatment of individuals with rib fractures.

Camarena A et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004441

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PLATELET-RICH PLASMA ENHANCES RIB FRACTURE STRENGTH AND CALLUS FORMATION IN VIVO

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Structural Racism, Residential Segregation, and Exposure to Trauma: The Persistent Impact of Redlining

Aim

To assess the association of *historical redlining* within Austin, Texas to spatial patterns of penetrating traumatic injury.

Methods

Comparison of the incident rate of penetrating trauma that occurred in historically redlined vs. non-redlined census tracts.

Results

The incident rate of penetrating trauma in redlined areas was **higher** compared to non-redlined areas.

	IRR	95% CI	P-value
Redlined	1.42	1.19 - 1.69	< .001
Not Redlined	0.42	0.39 - 0.64	< .001
Not Graded	0.52	0.27 - 0.99	< .05

*Adjusted incident rate ratio

Bradford JM et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004290

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STRUCTURAL RACISM, RESIDENTIAL SEGREGATION, AND EXPOSURE TO TRAUMA: THE PERSISTENT IMPACT OF REDLINING

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Primary Care Follow-up Improves Outcomes in Older Adults Following Emergency General Surgery (EGS) Admission

Population-based cohort study of 77,000 independent older adults (>65 years)

Admitted for EGS condition

Within 14 days of discharge

42% Primary care follow-up

58% No primary care follow-up

Early primary care follow-up independently associated with 13% reduced risk of nursing home admission or death in the year after surgery

Protective effect of primary care was seen across age groups, frailty levels, and for operative & non-operative patients

Strategies needed to **incentivize & ensure** early primary care follow up after EGS admission

Guttman MP et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004464

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PRIMARY CARE FOLLOW-UP IMPROVES OUTCOMES IN OLDER ADULTS FOLLOWING EMERGENCY GENERAL SURGERY ADMISSION

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The Impact of Transfusion Kinetics on the Inflammatory Response Following Major Injury

PROPPR Dataset

12 Level 1 Trauma Centers Nationwide

Resuscitation Following Major Injury

1:1:1 Platelets

1:1:2 Fresh Frozen Plasma

Red Blood Cells

CAT Episode

3 units RBCs over 60 minutes

Linear Growth Model with Time Varying Covariates Adjusting for:

- Age
- BMI
- Race
- Shock Index
- Mechanism of Injury
- Sex
- Total units of RBC
- Platelets
- FFP

The volume and tempo of blood administration following injury produces a significant difference in response of **anti-inflammatory cytokines and chemokines**

0.966
0.939

Carney PR et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004399

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THE IMPACT OF TRANSFUSION KINETICS ON THE INFLAMMATORY RESPONSE FOLLOWING MAJOR INJURY

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Prospective Derivation and Validation of a NECROTIZING Soft Tissues Infections (NECROSIS) Score: An EAST Multicenter Trial

NECROTIZING soft tissues infections (NSTIs) are associated with adverse outcomes.

Current risk scores demonstrate poor accuracy.

Derivation Cohort n=362

Validation Cohort n=131

3 Independent Predictors of NSTI

16 U.S. Trauma Centers

SBP <120mmHg WBC >15 Violaceous Skin

	SENS	SPEC	PPV	NPV
1	92%	57%	89%	53%
2	54%	75%	92%	26%
3	38%	100%	100%	21%

STUDY OBJECTIVE

Derive and validate a risk index score for identifying NSTIs based on routinely measured clinical data.

STUDY CONCLUSION

NECROSIS is a simple and potentially useful clinical index score for identifying NSTIs in at-risk patients.

Kim DY *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004374

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PROSPECTIVE DERIVATION AND VALIDATION OF A NECROTIZING SOFT TISSUE INFECTIONS SCORE: AN EASTMULTICENTER TRIAL

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Characterizing Trauma Patients with Delays in Orthopaedic Process Measures

Statewide Collaborative Data from 35 Level 1 and 2 Trauma Centers

>24 hours

n=5,199

Risk Factors Associated with Delay in Femur Fixation

ISS > 35

Age

↑ Complications with Delay

Pneumonia

ICU Return

Should we "risk adjust" process measures?

Do all patients go in the denominator?*

n

Gohel N et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004346

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CHARACTERIZING TRAUMA PATIENTS WITH DELAYS IN ORTHOPEDIC PROCESS MEASURES

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The Impact of Post-Operative Enteral Nutrition on Duodenal Injury Outcomes: A Post Hoc Analysis of an EAST Multicenter Trial

Retrospective Review 1/2010 – 12/2020
35 Level I trauma centers

113 duodenal leaks following surgical repair of traumatic duodenal injuries

Nutrition Strategies Compared:
Enteral Nutrition= 43
Parenteral Nutrition= 22
EN+PN= 48

Time Until Leak Closure	7 days	15 days	25 days	p<0.008
Bacteremia or Fungemia	12%	32%	38%	p=0.017
Abdominal Abscess	54%	64%	81%	p=0.017
Hospital Length of Stay	27 days	44 days	45 days	p=0.001

PN was NOT associated with decreased time until leak closure

EN was associated with ↓ days until leak closure, ↓ infectious complications, ↓ length of stay

EN should be utilized in patients with duodenal leak whenever feasible

Charon RL et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004303

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THE IMPACT OF POSTOPERATIVE ENTERAL NUTRITION ON DUODENAL INJURY OUTCOMES: A POST HOC ANALYSIS OF AN EASTERN ASSOCIATION FOR THE SURGERY OF TRAUMA MULTICENTER TRIAL
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Obesity is a Predictor of Abdominal CT Imaging in Pediatric Trauma Patients

Study Population: ACS TQIP 2017-2020
Pediatric Trauma Pts With Isolated Abdominal Trauma Managed Nonoperatively (n = 10,204)

Patient Stratification:
Underweight 24.4%
Normal 51.6%
Overweight 18.8%
Obese 5.2%

Independent Predictors of CT Imaging:
Age 1.08x
Male Gender 1.14x
White Race 0.84x
Penetrating Injury 1.16x
Obesity 1.3x
ACS L II or lower TC 1.6x

Colosimo C et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004424

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OBESITY IS A PREDICTOR OF ABDOMINAL COMPUTED TOMOGRAPHY IMAGING IN PEDIATRIC TRAUMA PATIENTS
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Are Pediatric Trauma Centers Located Close to the High-Risk Populations? A Geolocation Study

Methods: Trauma is the #1 public health problem in the pediatric population. Below vs Above Poverty Level. Greater than 30 miles from PTC. Map geocoded with census tract data.

Results: Comparison of children without access to PTC. Children Above Poverty vs Children Below Poverty. Difference in Access for Children Above Poverty +24.8%. Difference in Access for Children Below Poverty +22.8%.

Conclusions: Greater improvement to access in children above poverty level. Difference in Access for Children Above Poverty +24.8%. Difference in Access for Children Below Poverty +22.8%.

Williams K et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004452

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ARE NEW PEDIATRIC TRAUMA CENTERS LOCATED CLOSE TO THE HIGH-RISK POPULATIONS? A GEOLOCATION STUDY
[HTTPS://JOURNALS.LWW.COM/JTRAUMA/ABSTRACT/2024/12000/ARE_NE W_PEDIATRIC_TRAUMA_CENTERS_LOCATED_CLOSE_TO17.ASPX](https://journals.lww.com/jtrauma/abstract/2024/12000/are_new_pediatric_trauma_centers_located_close_to17.aspx)

Suppressing upregulation of fibrinogen after polytrauma mitigates thrombosis in mice

siRNA against fibrinogen encapsulated in lipid nanoparticles (siFga). siFga mitigates the rise of fibrinogen post-injury. siFga decreases thrombosis post-injury.

Kastrup CJ et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004442

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SUPPRESSING UPREGULATION OF FIBRINOGEN AFTER POLYTRAUMA MITIGATES THROMBOSIS IN MICE
[HTTPS://JOURNALS.LWW.COM/JTRAUMA/ABSTRACT/2024/12000/SUPPRESSI NG_UPREGULATION_OF_FIBRINOGEN_AFTER18.ASPX](https://journals.lww.com/jtrauma/abstract/2024/12000/suppressing_upregulation_of_fibrinogen_after18.aspx)

Plasma treatment is associated with decreased brain lesion and resuscitation requirements after traumatic brain injury in a swine model of prolonged damage-control resuscitation

Addition of plasma to prolonged damage-control resuscitation protocol reduce resuscitation volume and improve survival following hemorrhagic shock.

Hemorrhage + TBI. Damage Control Resuscitation + fresh frozen plasma (FFP).

Reduced resuscitation requirements. Reduced brain lesion size and improved functional neurologic recovery.

Alam HB et al. *Journal of Trauma and Acute Care Surgery*. DOI: 10.1097/TA.0000000000004457

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PLASMA TREATMENT IS ASSOCIATED WITH DECREASED BRAIN LESION AND RESUSCITATION REQUIREMENTS AFTER TRAUMATIC BRAIN INJURY IN A SWINE MODEL OF PROLONGED DAMAGE-CONTROL RESUSCITATION
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READ THE ARTICLE ADULT EMERGENCY RESUSCITATIVE THORACOTOMY: A WESTERN TRAUMA ASSOCIATION CLINICAL DECISIONS ALGORITHM

ADULT EMERGENCY RESUSCITATIVE THORACOTOMY: A WESTERN TRAUMA ASSOCIATION CLINICAL DECISIONS ALGORITHM

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READ THE ARTICLE MANAGEMENT OF SPINAL TRAUMA IN PREGNANT PATIENTS: A SYSTEMATIC REVIEW OF THE LITERATURE

MANAGEMENT OF SPINAL TRAUMA IN PREGNANT PATIENTS: A SYSTEMATIC REVIEW OF THE LITERATURE

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