

Trauma REACH
Pediatric Trauma and
Critical Care Preparedness

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Disclosures

- No Conflicts of Interest
- \$25,000 award for imaging reduction work from MCIC
 - MCIC is the malpractice insurer for the University of Rochester. We use the money to pay programmers. We receive no money.
- DW has unrelated patent pending for medical devices
 - No financial benefits to date



Agenda


- Discuss Critical Care Preparedness related to injured children (DD)
- Pediatric Trauma Imaging (DW)
- Pediatric Emergency Preparedness / PECC (DW/LP)



Pediatric Trauma - Critical needs assessment and injury patterns in the pediatric patient

David Darcy, MD
Assistant Professor of Surgery and Pediatrics
Golisano Children's Hospital, SMH of URM

MEDICINE of THE HIGHEST ORDER




The Why and How



MEDICINE of THE HIGHEST ORDER




The Who




- ED Attending
- ED / SCC Fellow
- Surgery Resident/APP/Attending
- ER Fellow/Resident
- Respiratory Therapist
- RN bedside x2
- RN recording
- ER Tech
- Radiology Tech
- Child Life
- Social Work
- Family
- PICU representative
- Anesthesia
- Ortho, Neurosurgery


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The Who




Air ambulance: ACLS, blood products
 Ground transport: ACLS vs BLS, similar transport times







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The How

Head C-spine Airway		- TBI = major killer - Nuances to c-spine clearance, intubation Did you rule out abuse?
Chest		- Underlying injury w/o rib fx - Limited use of chest CT Did you rule out abuse?
Abd/pelvis		- Unique patterns - Screening labs - FAST? - Selective NOM Did you rule out abuse?


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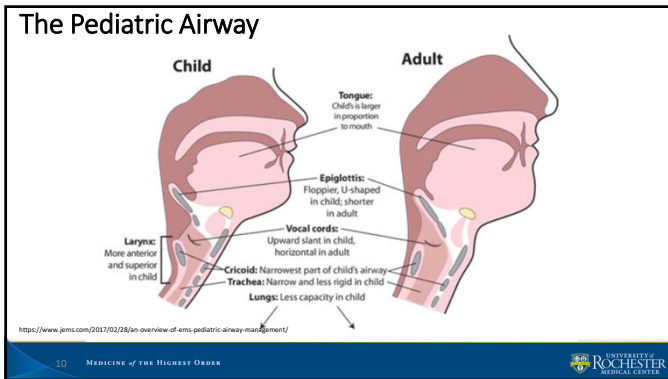


Airway

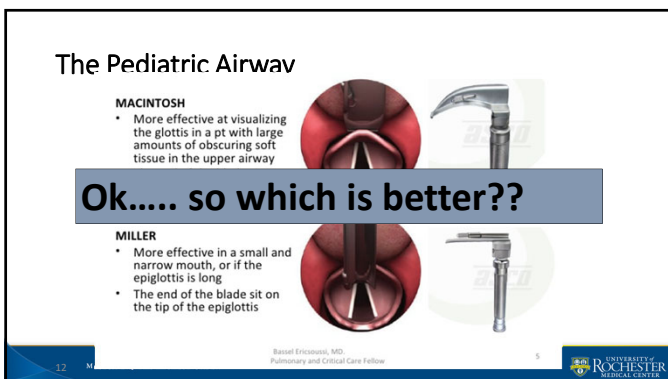
- The indications for endotracheal intubation in pediatric trauma are the same as for adults
 - respiratory distress
 - Glasgow coma scale less than 8
 - actual or impending or potential airway obstruction
 - ? Length of transport

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The Pediatric Airway

Comparison of the laryngoscopy views with the size 1 Miller and Macintosh laryngoscope blades lifting the epiglottis or the base of the tongue in infants and children <2 yr of age¹

¹ Passi, M, Sathiyamoorthy, J, Lerman, C, Heard, M, Marino, J, P, Thompson
 BJR: British Journal of Anaesthesia, Volume 113, Issue 5, November 2014, Pages 969-974.

Conclusion: Mac and Miller achieve similar views and time to intubation when used as intended.

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The Pediatric Airway

GLIDESCOPE AVL (NEONATE/SMALL CHILD)

- Designed for small airways for a broad range of pediatric patients sizes
- Signature Glidescope blade angle improves your view of the glottis
- Reveal™ Anti-fog Technology with a rapid heating profile to minimize lens fogging

<https://www.verathon.com/glidescope-avl/>

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The Pediatric Airway

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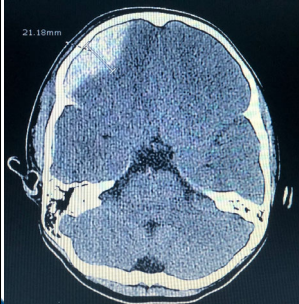
The Pediatric Airway



The Pediatric Airway

ZONE	3 kg	4 kg	5 kg	PINK	RED	PURPLE	YELLOW	WHITE	BLUE	ORANGE	GREEN
ET TUBE (mm)	11 uncuffed	11 uncuffed	11 uncuffed	11 uncuffed	11 cuffed	11 uncuffed	11 uncuffed	11 uncuffed	11 uncuffed	11 cuffed	11 cuffed
Lip-Tip (cm)	9-9.5	9.5-10	10-10.5	10-10.5	10.5-11	11-12	12.5-13.5	14-15	16.5-16.5	17-18	18.5-19.5
Suction	8 F	8 F	8 F	8 F	8-10 F	10 F	10 F	10 F	10 F	10 F	12 F
L-SCOPE blades	1 straight	1 straight	1 straight	1 straight	1 straight	1 straight	1 straight	1 straight	1 straight	1 straight	1 straight
Stylet	6 F	6 F	6 F	6 F	6 F	6 F	6 F	6 F	6 F	6 F	6 F
Oral Airway	50 mm	50 mm	50 mm	50 mm	60 mm	60 mm	60 mm	60 mm	70 mm	80 mm	80 mm
NP Airway	14 F	14 F	14 F	14 F	14 F	18 F	20 F	22 F	24 F	24 F	28 F
BVN Minimum Volume-mls	450 mL	450 mL	450 mL	450 mL	450 mL	450 mL	450 mL	450 mL	450 mL	450 mL	1000 mL
ETCO ₂	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR	90% O ₂ DETECTOR
LMA	1	1	1	1.5	1.5	2	2	2	2.5	2.5	3
TIDAL VOLUME	24-36 mL	30-50 mL	40-60 mL	50-80 mL	70-100 mL	80-100 mL	100-120 mL	100-120 mL	100-120 mL	100-120 mL	100-120 mL
FREQUENCY (BPM)	20-25	20-25	20-25	20-25	20-25	15-25	15-25	15-25	15-25	12-20	12-20

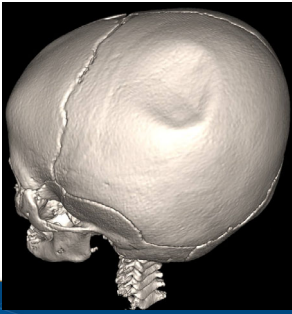
Neurotrauma



	Early mortality (<24h)	Late mortality (>24h)
	Median (IQR)	Median (IQR)
AIS Head & Neck	4 (0, 5)	5 (4, 5)
AIS Face	0 (0, 1)	0 (0, 1)
AIS Chest	0 (0, 3)	0 (0, 3)
AIS Abdomen	0 (0, 1)	0 (0, 2)
AIS Extremity	0 (0, 2)	0 (0, 2)
AIS External	0 (0, 0)	0 (0, 0)

Mitzaughlin C, Zagory JA, Fenlon M, Park C, Lane CJ, Moxler D, et al. Timing of mortality in pediatric trauma patients: A National Trauma Data Bank analysis. J Pediatr Surg 2018;53:344-51. <https://doi.org/10.1054/jps.2017.53.005>

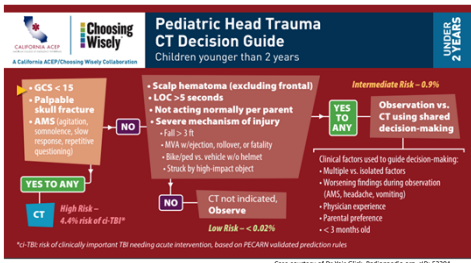
Neurotrauma



Case courtesy of Dr Yair Glick, Radiopaedia.org, ID: 53304



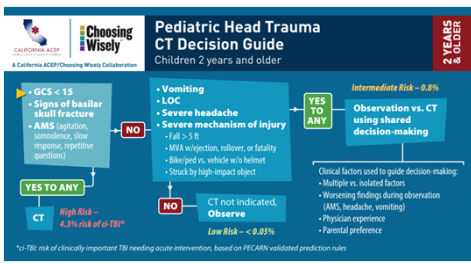
Neurotrauma



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Neurotrauma




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Neurotrauma

- General goals for severe TBI:
 - Normothermic, euvolemic, oxygenated
 - Correct coagulopathy
 - ICP monitoring “suggested”
 - ICP <20
 - CPP >40
 - **3% favored** over mannitol
 - Seizure ppx ok <7 days




Kochanek et al. Guidelines for the Management of Pediatric Severe Traumatic Brain Injury, Third Edition: Update of the Brain Trauma Foundation Guidelines, Executive Summary, Pediatric Critical Care Medicine, March 2019 - Volume 20 - Issue 3 - p.280-289

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Cervical Spine Trauma

- Stabilize in the field, stabilize in the bay



PAPOOSE®

- Securely and gently immobilizes the head and spine in the proper anatomical airway and spinal alignment
- Occipital shape protects against positional plagiocephaly
- Allows for continued intimacy between caregiver and child
- True cervical spine immobilizer for infants up to 3 months

PART#	DESCRIPTION	SIZE
PO-100	Papoose without PO Front	Infants up to 3 months
PA-100	Papoose with PO Front	Infants up to 3 months
PAR-100	Papoose with PO Front and pads	Infants up to 3 months


Additional replacement pads available

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C-Spine Clearance: Who Doesn't Need Imaging?


No Imaging Needed

- GCS 14 or 15
- Not intoxicated
- < 3 years & no high-risk mechanism*




- No neurologic deficit
- No midline tenderness
- No distracting injuries
- No unexplained hypotension


***Exceptions Based on Mechanism (<3 years)**



Fall > 10 feet




Motor Vehicle Collision




Non-Accidental Trauma

Special Populations



- Persistent pain & normal x-rays
- Advanced imaging vs. c-collar?



- Obtunded or intubated & normal CT
- Risk of pressure sore w/ c-collar
- MRI or remove c-collar?

AVOID over-imaging for c-spine clearance

Breathing

- Small tubes, small LMAs
 - 3.5 uncuffed, Size 1 LMA

- 4-6cc/kg tidal volume
 - PEEP 5
 - Peak Inspiratory Pressure = IP + PEEP: target 20-24
 - FiO2 1.0, wean rapidly, normocarbia 25-30bpm

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Circulation

- 2 IVs
 - Central line vs IO?


- 20cc/kg IV crystalloid
 - What's next?
 - Balanced transfusion if possible

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Early use of blood in resuscitating pediatric trauma patients		
Background	New Protocol	Rationale
<ul style="list-style-type: none"> • Prior protocols suggested 3 boluses of crystalloid prior to blood transfusion <div style="display: flex; align-items: center; margin: 5px 0;"> → </div> <p style="font-size: 8px; margin: 0;">20ml/kg 20ml/kg 20ml/kg PRBC</p> <ul style="list-style-type: none"> • Earlier use of blood is advantageous in the context of hemodynamic instability 	<div style="text-align: center; margin-bottom: 10px;"> </div> <p style="font-size: 8px; margin: 0;">In pediatric trauma, failure of a sustained hemodynamic response to a <u>single</u> bolus of 20mL/kg crystalloid should be followed by blood transfusion</p> <div style="display: flex; align-items: center; margin: 5px 0;"> → </div> <p style="font-size: 8px; margin: 0;">20ml/kg PRBC</p>	<ul style="list-style-type: none"> • Children may lose 45% of blood volume prior to developing hypotension • Progression to hypotension is associated with an increased risk of death • Excess crystalloid is detrimental <ul style="list-style-type: none"> • Longer time on ventilator • Longer length of stay • But no increase in death <div style="display: flex; justify-content: center; align-items: center; margin-top: 10px;"> </div>

Thoracic Trauma

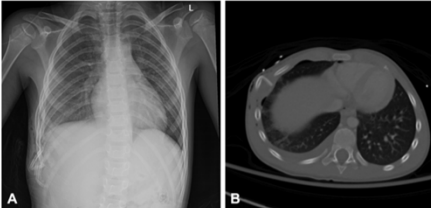
- MVC = commonly chest trauma in children
 - Usually polytrauma
- **CXR** - initial screening
- **CT chest** more radiation than CXR
 - NOT routine
 - Penetrating okay
 - Consider if obtunded, unexaminable



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Thoracic Trauma

- Ribs bend but not break
- Rib fx in child <3 years = abuse until proven otherwise




Abbottlar 2M, Ishihara M, Kim JD. Surgical Stabilization of Rib Fractures in a 6-Year-Old Child After Blunt Trauma. *Ann Thorac Surg.* 2017;104(5):1433-1441. doi:10.1016/j.athoracsur.2017.07.034

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Thoracic Trauma

- 20 cc/kg hemothorax → OR for thoracotomy
- ED thoracotomy
 - Worse outcomes than adults (3% vs 6% survival)
 - **Penetrating arrest with signs of life scene** → hospital
 - **Blunt traumatic arrest not salvageable**
 - Consider for age 15+



Flynn-O'Brien et al. Mortality after emergency department thoracotomy for pediatric blunt trauma: Analysis of the National Trauma Data Bank 2007-2012. *J Pediatr Surg.* 2016;51(1):163-167. doi:10.1016/j.jpedsurg.2015.10.034
 Moore, Hunter B et al. "Pediatric emergency department thoracotomy: A 40-year review." *Journal of pediatric surgery vol. 51.2* (2016): 315-8. doi:10.1016/j.jpedsurg.2015.10.040
 Moskowitz EE, Burlew CC, Kulungowski AM, Benstead DD. Survival after emergency department thoracotomy in the pediatric trauma population: a review of published data. *Pediatr Surg Int.* 2018;34(8):107-109. doi:10.1007/s00383-018-4200-9

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Abdominal Trauma

Updated APSA Blunt Liver/Spleen Injury Guidelines 2019

Admission

- ICU Admission Indicators**
 - Abnormal vital signs after initial volume resuscitation
- ICU**
 - Activity - Bedrest until vitals normal
 - Labs - q4hour CBC until vitals normal
 - Diet - NPO until vital signs normal and hemoglobin stable
- Ward**
 - Activity - No restrictions
 - Labs - CBC on admission and/or 6 hours after injury
 - Diet - Regular diet

Procedures

- Transfusion**
 - Unstable vitals after 20 cc/kg bolus of isotonic IVF
 - Hemoglobin < 7
 - Signs of ongoing or recent bleeding
- Angioembolization**
 - Signs of ongoing bleeding despite pHRC transfusion
 - Not indicated for contrast blush on admission CT
 - without unstable vitals
- Operative exploration with Control of Bleeding**
 - Unstable vitals despite pHRC transfusion
 - Consider massive transfusion protocol

Set Free

- Based on clinical condition **NOT** injury severity (grade)
- Tolerating a diet
- Minimal abdominal pain
- Normal vital signs

Aftercare

- Activity Restriction**
 - Restricting activity to grade plus 2 weeks is safe
 - Shorter restrictions may be safe but there is inadequate data to support decreasing these recommendations
- Follow up imaging**
 - Risk of delayed complications following spleen and liver injuries is low
 - Consider imaging for **symptomatic** patients with prior high grade injuries

<https://apso.org/apso/media/Documents/APSAsolidOrganInjuryGuidelines2019.pdf>

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Child Abuse

Rank	Age Groups										All Ages	
	<1	1-2	3-9	10-14	15-23	24-34	35-49	50-54	55-69	70+		
1	Child Abuse 4,473	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113
2	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113
3	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113
4	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113
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9	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113
10	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113	Child Abuse 1,113

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Child Abuse

"Red Flag" History of Present Injury

- No history or inconsistent hx
- Changing history
- Unwitnessed injury
- Delay in seeking care
- Prior ED visit
- Domestic Violence in home
- Premature infant (< 37 weeks)
- Low birth weight/IUGR
- Chronic medical conditions

"Red Flag" Physical Exam Findings Infant

- Torn frenulum
- FIT (weight, length, head circumference)
- Large heads in infants (consider measuring of OFC in children < 1 yr)
- Any bruise in any non-ambulating child - "if you don't cruise you don't bruise"
- Any bruise in a non-exploratory location (especially the TEN region-Torso (area covered by a standard girl's bathing suit), Ears and Neck) < 4yrs old (TEN-4)
- Bruises, marks, or scars in patterns that suggest hitting with an object

"Red Flag" Radiographic Findings

- Metaphyseal fractures (corner)
- Rib fractures (especially posterior) in infants
- Any fracture in a non-ambulating infant
- An undiagnosed healing fracture
- SDH and/or SAH on neuro-imaging in young children, particularly in the absence of skull fracture <1 year

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Child Abuse


If any provider expresses concern → do the work-up

<6 Months of Age	6–12 Months of Age	>12–36 Months of Age
<ul style="list-style-type: none"> • Social work consult • Skeletal survey • Head CT • AST, ALT, lipase • Abdominal CT if AST or ALT ≥80 • Troponin I for infants ≥3 months of age if AST or ALT ≥80, signs of chest trauma, or ill appearance • CBC, PT test, and PTT test if bruising or ICH present 	<ul style="list-style-type: none"> • Social work consult • Skeletal survey • AST, ALT, lipase • Abdominal CT if AST or ALT ≥80 • Troponin I if AST or ALT ≥80, signs of chest trauma, or ill appearance • Head CT for facial bruising, abnormal neurological examination, or other clinical concern • CBC, PT test, and PTT test if bruising or ICH present 	<ul style="list-style-type: none"> • Social work consult • Skeletal survey for <24 months for 24–36 months if severely injured • Strongly consider ALT, AST, lipase • Abdominal CT if AST or ALT ≥80 • Troponin I if AST or ALT ≥80, signs of chest trauma, or ill appearance • Head CT for abnormal neurological examination or other clinical concern • CBC, PT test, and PTT test if bruising or ICH present

Reveley LC, Frye TM, Fain ET, Dennis EM, Bennett BL, Mottagh-Khorasani E. Standardizing the Evaluation of Nonaccidental Trauma in a Large Pediatric Emergency Department. *Pediatrics*. 2018;141(1):e20171964. doi:10.1542/peds.2017.1994

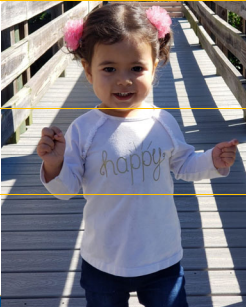
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Wrap Up

<p>Head C-spine Airway</p>		<p>- TBI = major killer - Nuances to c-spine clearance, intubation Did you rule out abuse?</p>
<p>Chest</p>		<p>- Underlying injury w/o rib fx - Limited use of chest CT Did you rule out abuse?</p>
<p>Abd/pelvis</p>		<p>- Unique patterns - Screening labs - FAST? - Selective NOM Did you rule out abuse?</p>


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Wrap Up - Call/setup transport early, air vs ambulance

<p>Head C-spine Airway</p>		<p>- Airway, 3,5, bag - C-collar, papoose, stabilization</p>
<p>Chest</p>		<p>- Underlying injury w/o rib fx - Limited use of chest CT - Chest tubes in polytrauma</p>
<p>Abd/pelvis</p>		<p>- Unique patterns - Screening labs - FAST? - Selective NOM</p>

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Trauma Imaging in Pediatric Pts



ACS TQIP
BEST PRACTICES
GUIDELINES IN
IMAGING

ACS **tqip** TRAUMA QUALITY IMPROVEMENT PROGRAM

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Pediatric Trauma – Imaging, Quality Improvement, and Emergency Preparedness

Derek Wakeman, MD
 Associate Professor of Surgery and Pediatrics
 Golisano Children's Hospital, SMH of URM

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Approaches to trauma imaging

Pan Scan: Head, neck, chest, abdomen/pelvis

- Pro's: easy, quick, get answers quickly, little else left to chance, can often d/c from ED if not significant injuries
- Con's: radiation, expensive if ordering unnecessary scans, may find occult things that then require other w/u though they were asx

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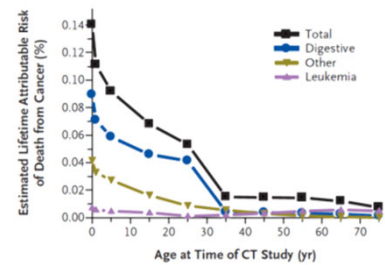
Approaches to trauma imaging

Selectively scan (based on signs/symptoms)

- Pro's: limits radiation, may be cheaper
- Con's: requires more "work/thought/hand wringing/nervousness", often requires admission for serial exams (no ED d/c), may miss injuries (though clinically significant injuries should be caught on serial exams/tertiary)
- Useful in Children's hospitals where trauma volumes are not as high and ability to admit and observe is better. Spares sensitive population radiation



Abdominal CT, 240 mAs



N Engl J Med 2007; 357:2277-84.

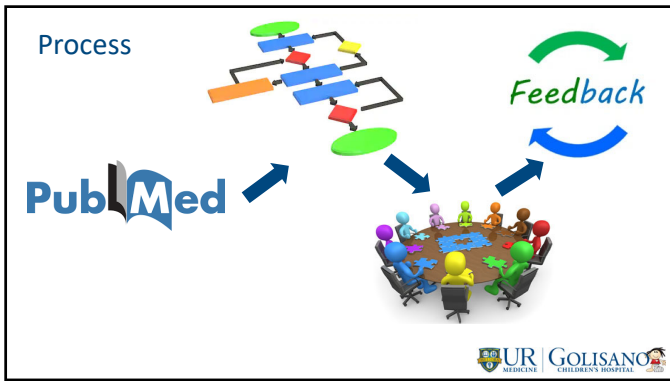


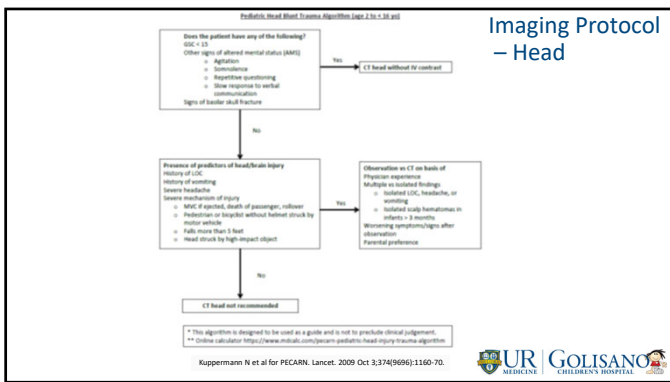
JAMA Surgery | Original Investigation

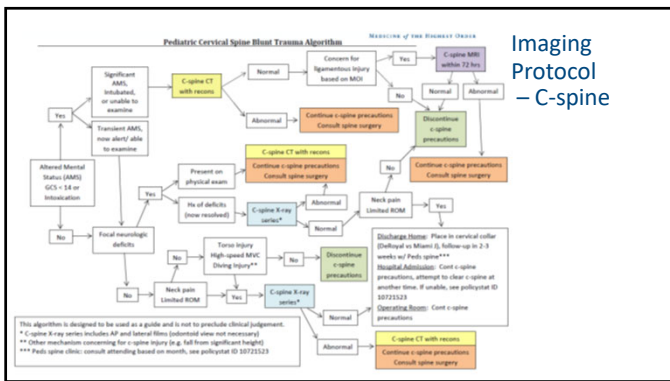
Risk of Hematologic Malignant Neoplasms From Abdominopelvic Computed Tomographic Radiation in Patients Who Underwent Appendectomy

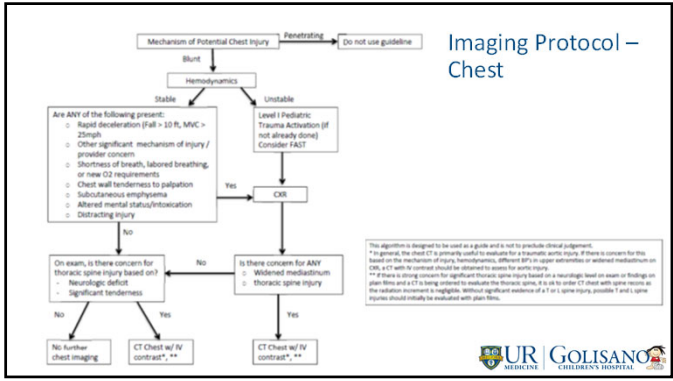
Kyung Hee Lee, MD, PhD; Seungjae Lee, MS; Ji Hoon Park, MD, PhD; Sung Soo Lee, MS; Hae Young Kim, MD, PhD; Won Jin Lee, MD, PhD; Eun Shil Cha, PhD; Kwang Pyo Kim, PhD; Woojoo Lee, PhD; Ji Yun Lee, MD; Kyoung Ho Lee, MD, PhD

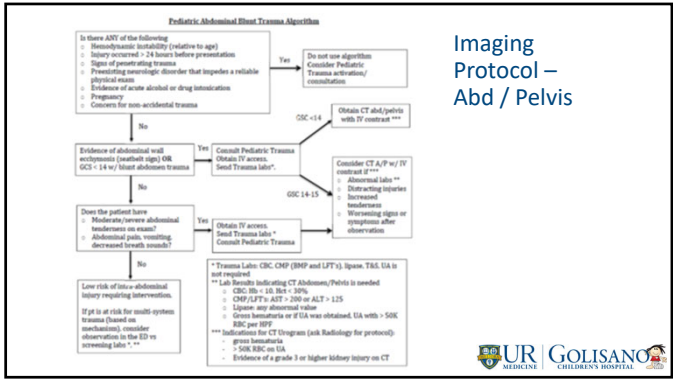








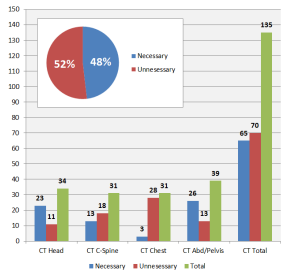






Retrospective Results

135 CT scans in 45 children (average 3 scans/patient)
 52% of CT scans "unnecessary" according to the protocols
 Unnecessary CT scans identified"
 → 12 pulmonary contusions
 → 3 tiny occult pneumothoraxes
 → 1 non-displaced orbital fracture that might not otherwise have been found
 → None of these injuries required injury-specific intervention

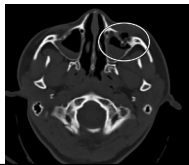




Pulmonary contusions: 12



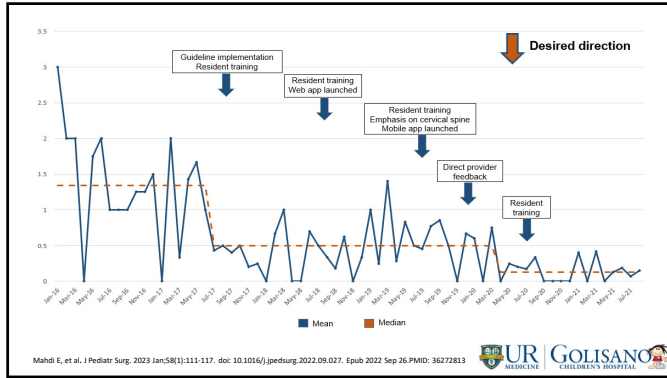
Occult pneumothoraces: 3



Non-displaced Orbit fracture: 1







PI Letter

THANK YOU FOR THE CARE YOU PROVIDED! [redacted] after he was involved in an auto crash. As you may know, the Pediatric Trauma Program at the Golisano Children's Hospital is striving to reduce the number of unnecessary CT scans in pediatric blunt trauma patients in a quality improvement effort to limit the amount of radiation they are exposed to. After reviewing this child's case, we believe the CT of the chest was probably not necessary. We have developed algorithms to guide CT imaging of injured children, which we have validated retrospectively, and have been using in practice since July 2019. We are not aware of any clinically significant injuries that have been missed as a result of these implementations and we continue to monitor the data. Please consider using our stratified algorithm to guide your decision making when caring for injured children with blunt traumatic injuries.

If there are details of the case that directed the CT scan that we may have not appreciated in our review, we would be happy to discuss the case further with you.

Sincerely,

Lauren Williams MD BSN CCSK-CMCP-TCS
 Pediatric Trauma Program Manager
 UR Medicine Golisano Children's Hospital
 Email: Lauren_Williams@golc.org

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 Pediatric Trauma Medical Director
 Email: Derek_Wakeman@URMC.ruchds.org
 Office: 585-275-4415; Cell: 585-353-1317

Conclusions

- Significant reductions in imaging pediatric trauma patients are possible (without compromising care) using QI methodology
- Feedback from AND to stakeholders is key

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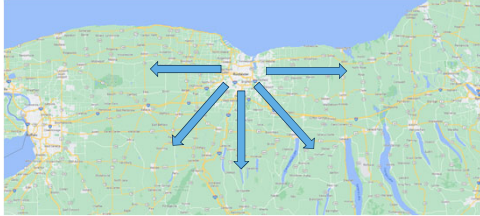
journal homepage: www.elsevier.com/locate/jpedsurg.org

Sustaining the gains: Reducing unnecessary computed tomography scans in pediatric trauma patients

Elia Mahdi^a, Nicole Toscano^a, Lauren Pierson^a, Eric Ndikumana^a, Brian Ayers^a, Alexander Chacon^a, Anne Brayer^a, Mitchell Chess^a, Colleen Davis^a, Robert Dorman^a, Michael Livingston^a, Marjorie Arca^a, Derek Wakeman^{a,*}

Next Steps

- New QI Project to reduce unnecessary CT (not indicated by guidelines) for children transferred in



Methodology

- Offer validated imaging guidelines to hospitals throughout the region
- Provide teaching for imaging guidelines implementation
- Track not indicated CT scan rate for children transferred in prospectively (currently doing this)
- Provide feedback when CT's done off guideline





Pediatric Preparedness


JAMA Network | Open.

Original Investigation | Emergency Medicine

Emergency Department Pediatric Readiness and Short-term and Long-term Mortality Among Children Receiving Emergency Care

Craig D. Newgard, MD, MPH, Amber Lin, MS, Susan Malveau, MS, Jennifer N. B. Cook, GCPH, McKenna Smith, MPH, Nathan Kuppermann, MD, MPH, Katherine E. Ramick, MD, Marianne Gaucho-Hill, MD, Jeremy Goldhaber-Falbert, PhD, Randall S. Burd, MD, PhD, Hilary A. Heweis, MD, Apoorva Salvi, MS, Hsiang-Chang Xin, PhD, Stefanier G. James, MD, MS, Peter C. Jenkins, MD, MS, Jennifer Mann, MD, MS, Matthew Hansen, MD, MCR, Nina E. Glass, MD, Avery B. Nathens, MD, PhD, K. John McConnell, PhD, Mengtao Dai, MS, Brendan Carr, MD, MS, Rachel Ford, MPH, Davis Yanez, PhD, Sean R. Babcock, MS, Benjamin Lang, MD, N. Clay Mann, PhD, MS, for the Pediatric Readiness Study Group


- Retrospective study of children (< 18 yo) receiving emergency care at 983 EDs in 11 states from January 1, 2012, through December 31, 2017.



Pediatric Preparedness

- ED pediatric readiness of the initial ED, measured through the weighted Pediatric Readiness Score (wPRS; range, 0-100) from the 2013 National Pediatric Readiness Project assessment.
- 90,963 children in the injury cohort (2.0% deaths)
- 705,974 in the medical cohort (1.1% deaths)


Newgard CD, et al. for the Pediatric Readiness Study Group. JAMA Netw Open. 2023 Jan 3;6(1):e2250941. doi: 10.1001/jamanetworkopen.2022.50941. PMID: 36637819.



Pediatric Preparedness

- Among the 983 EDs, the median wPRS was 73 (IQR: 59-87)
- Compared with EDs in the lowest quartile of ED readiness (quartile 1, wPRS of 0-58), initial care in a quartile 4 ED (wPRS of 88-100) was associated with 60% lower in-hospital mortality among injured children and 76% lower mortality among medical children.
- **If all EDs were in the highest quartile of pediatric readiness, an estimated 288 injury deaths and 1154 medical deaths may have been prevented.**

Newgard CD, et al. for the Pediatric Readiness Study Group. JAMA Netw Open. 2023 Jan 3;6(1):e2250941. doi: 10.1001/jamanetworkopen.2022.50941. PMID: 36637819.



Pediatric Preparedness

- Similar study of 274,756 injured children, including 4,585 (1.7%) who died
- Nine ED pediatric readiness components were associated with the greatest increase in survival:
 - **policy for mental health care (+8.8% change in survival)**
 - policy for patient assessment (+7.5%)
 - **specific respiratory equipment (+7.2%)**
 - **policy for reduced-dose radiation imaging (+7.0%)**
 - physician competency evaluations (+4.9%)
 - recording weight in kilograms (+3.2%)
 - life support courses for nursing (+1.0% to 2.5%)
 - policy on pediatric triage (+2.5%)
- There was a 268% improvement in survival when the five highest impact components were combined.

Newgard CD, et al. for the Pediatric Readiness Study Group. Ann Surg. 2022 Nov 1. doi: 10.1097/SLA.0000000000005741. Online ahead of print. PMID: 36538639.



Pediatric Preparedness

Impact of individual components of emergency department pediatric readiness on pediatric mortality in US trauma centers

Katherine Remick, MD, McKenna Smith, MPH, Craig D. Newgard, MD, MPH, Amber Liu, MS, Hilary Brown, MD, Aaron R. Jensen, MD, MEI, MS, Nina Glanz, MD, Rachel Ford, MPH, Stefania Ames, MD, MS, Jenny Cook, GCPIH, Susan Mahran, MS, Mengqiao Dai, MS, Mary Amelbach, MD, Peter Jenkins, MD, MSc, Marianne Gausche-Hill, MD, Mary Fallat, MD, Nathan Kuppermann, MD, MPH, and N. Clay Mann, PhD, MS, MBA, Salt Lake City, Utah

- 555 trauma centers
- Unadjusted analyses of 23 components of ED pediatric readiness showed that trauma centers with better-than-expected survival were more likely to have:
 - a validated pediatric triage tool
 - comprehensive quality improvement processes
 - a pediatric-specific disaster plan
 - **critical airway and resuscitation equipment**
- The multivariable analysis demonstrated that trauma centers with **both a physician and a nurse pediatric emergency care coordinator** had better-than-expected survival
- Child maltreatment policies were associated with lower-than-expected survival

Remick K, et al. J Trauma Acute Care Surg. 2023 Mar 1;94(3):417-424. doi: 10.1097/TA.0000000000003779. Epub 2022 Sep 1. PMID: 36045493.



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Pediatric Emergency Preparedness


Lauren Pierson MSN, PNP
Pediatric Trauma Program Manager

MEDICINE of THE HIGHEST ORDER




Emergency Medical Care

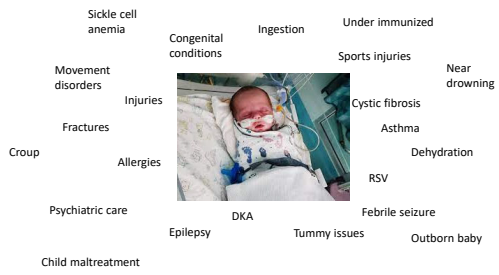
- More than 90% of pediatric emergency department visits do not occur in a dedicated pediatric emergency center.
- Most ED's care for less than 10 children per day.
- Variety in ED's
 - All populations
 - All conditions
 - All specialties



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Pediatric Emergencies



Sickle cell anemia

Congenital conditions

Ingestion

Under immunized

Movement disorders

Injuries

Sports injuries

Near drowning

Fractures

Cystic fibrosis

Asthma

Croup

Allergies

Dehydration

RSV

Psychiatric care

DKA

Febrile seizure


Epilepsy

Tummy issues

Outborn baby

Child maltreatment

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Pediatric Emergency Care Coordinator

- An individual or a group responsible for coordinating pediatric specific staff activities




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Roles and Responsibilities

- Promoting and sharing continuing education opportunities
- Encouraging pediatric simulations and hands on skills assessment
- Encouraging the use of pediatric clinical practice guidelines
- Identify resources for pediatric knowledge and inquiries



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Goal

Create an environment where children have the same quality of care as adults

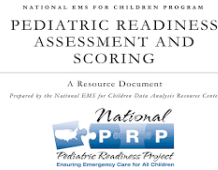


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How will this role bring about change?

- Advocacy and communication
 - Determine the needs of pediatric in your facility or agency
- Education/simulation
- Policy
 - Policies within your organization
- Resources



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Education

- **A pediatric emergency care coordinator is not expected to be the subject matter expert in all areas of pediatrics**
- **Maintain initial and ongoing competencies for staff**
- Educational responsibilities
 - Determine what kind of education your team needs based on population and need
 - Determine education based on inquiry/want
 - Utilize resources to plan education
 - Maintain records



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Roles of a PECC for Physicians, APP's, Nurses, and EMS

- Promote pediatric disaster readiness
- Work with leadership to obtain pediatric equipment, medications, and resources
- Facilitate and participate in pediatric performance improvement activities
- Assist with the development and periodic reviews of policies and procedures pertinent to pediatrics
- Verify knowledge of pediatrics in staff
- Coordinate learning activities for pediatrics



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Benefits of a PECC

- Increased pediatric readiness
- Safer, potentially more inviting, environment for kids
- Decreased in anxiety while taking care of kids
- Better patient outcomes
- Sustainable pediatric education



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Resources

- Develop a group to meet at designated times to discuss progress, discuss needs, or offer specialized education
- EMSC EIIC Site- Toolkits, research, education



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