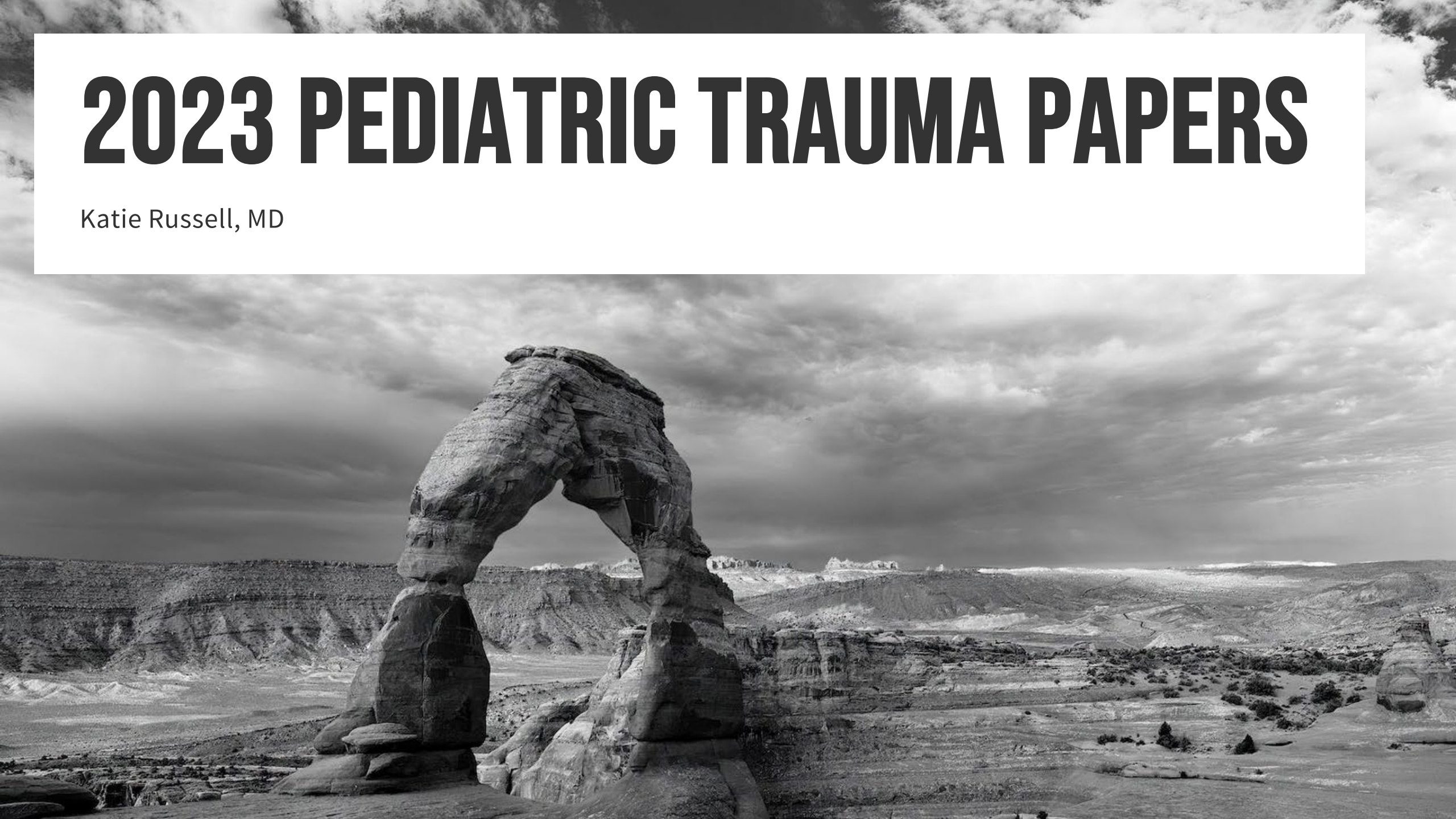
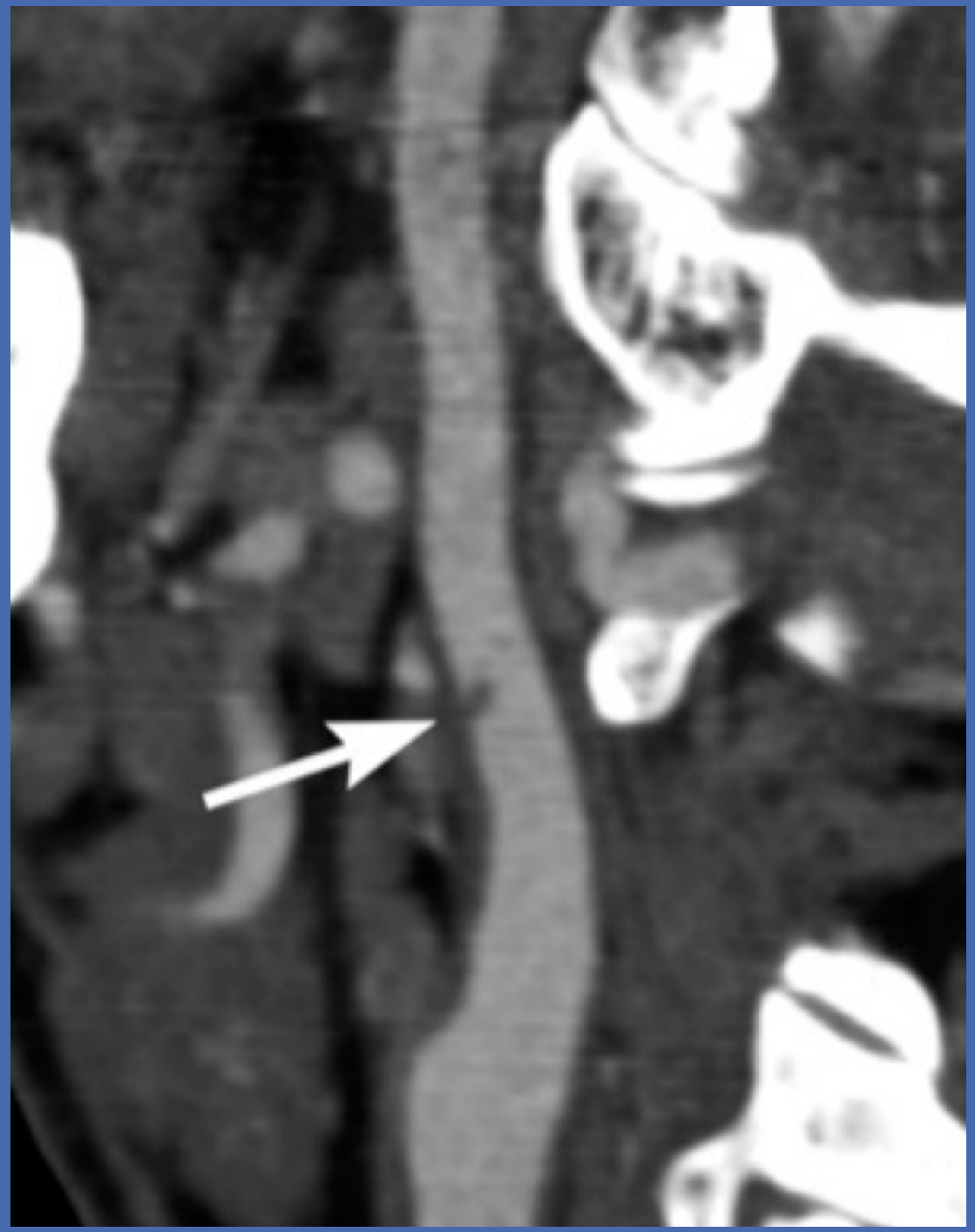
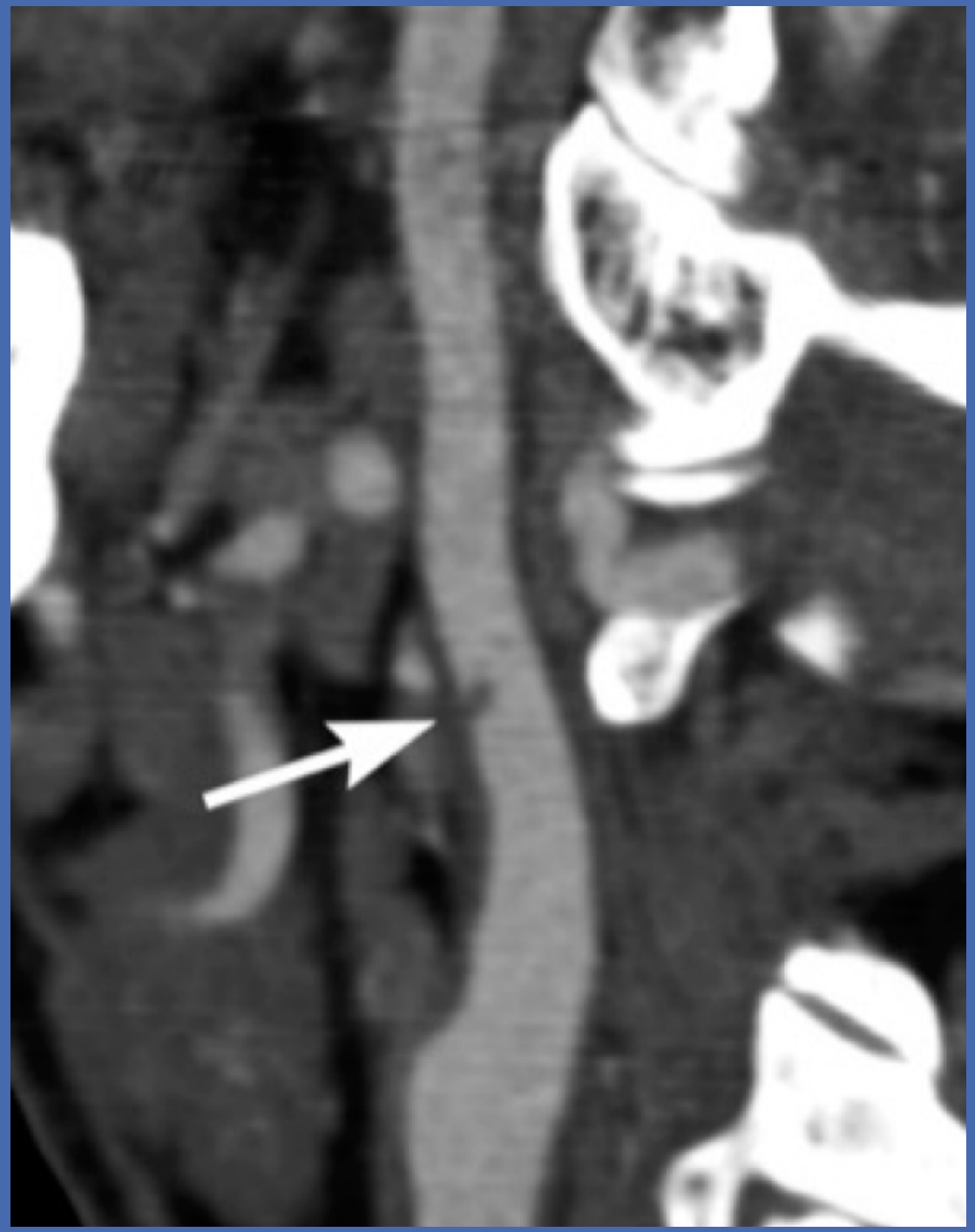
2023 PEDIATRIC TRAUMA PAPERS

Katie Russell, MD





BCVI



BCVI 1.3%

Stroke 29%

Mortality 3-19%

> J Trauma Acute Care Surg. 2023 Jan 25. doi: 10.1097/TA.0000000000003888.
Online ahead of print.

Diagnostic accuracy of screening tools for pediatric blunt cerebrovascular injury: An ATOMAC multicenter study

Todd A Nickoles [1], Ruth A Lewit, David M Notrica, Mark Ryan, Jeremy Johnson, Robert Todd Maxson, Jessica A Naiditch, Karla A Lawson [2], M'hamed Temkit [1], Benjamin Padilla, James W Eubanks 3rd

Affiliations + expand

PMID: 36693233 DOI: 10.1097/TA.0000000000003888

ATOMAC+

PROSPECTIVE MULTI CENTER COHORT

2017-2020 (1,461 patients)

<15 YO blunt face/head trauma

Memphis Criteria utilized

2 week follow-up

MEMPHIS

C-spine injury
Neuro exam not explained
Horner's
LeFort II or III
Skull base foramen lacerum

Neck soft tissue
Petrous t-bone

DENVER

LeFort II or III
C-spine 1-3 or foramen
Basilar skull w/ carotid canal

DAI w/ GCS <6
Petrous t-bone
Hanging
Neuro exam not explained
Stroke

EXPANDED DENVER

Mandible fx
Complex skull fx
Seatbelt sign
TBI w/ thoracic injury
Scalp degloving
Blunt cardiac rupture
Upper rib fx

EAST

Neuro exam not explained
Arterial bleed
GCS <9
Petrous t-bone
DAI
Fx c1-c3
C-spine subluxation
Left II or III

MCGOVERN

GCS <9 (1 point)
Focal deficit (2 points)
Carotid canal fx (2 points)
Petrous t-bone (3 points)
Cerebral infarct (3 points)
MVC or AVP (2 points)

UTAH

GCS <9 (1 point)
Focal deficit (2 points)
Carotid canal fx (2 points)
Petrous t-bone (3 points)
Cerebral infarct (3 points)

Table 3. Diagnostic accuracy of screening criteria.

		Met criteria N (%)	Received diagnostic imaging N (%)	Missed BCVI N (%)	Number of CTAs to detect one BCVI	Sensitivity % (95% CI)	Specificity % (95% CI)	PPV % (95% CI)	NPV % (95% CI)
Adult criteria	Memphis	437 (29.9)	220 (50.3)	2 (8.3)	19.9	91.7(73.0,99.0)	71.1(68.7,73.5)	5.0(3.2,7.5)	99.8(99.3,100.0)
	Denver	198 (13.6)	114 (57.6)	6 (25.0)	11.0	75.0(53.3,90.2)	87.5(85.6,89.1)	9.1(5.5,14.0)	99.5(99.0,99.8)
	Expanded Denver	533 (36.5)	216 (40.5)	3 (12.5)	25.4	87.5(67.6,97.3)	64.4(61.8,66.9)	3.9(2.5,6.0)	99.7(99,1,99.9)
	EAST	267 (18.3)	133 (49.8)	5 (20.8)	14.1	79.2(57.8,92.9)	82.7(80.7,84.7)	7.1(4.3,10.9)	99.6(99.0,99.9)
Pediatric criteria	Utah	71 (4.9)	47 (66.2)	13 (54.2)	6.5	45.8(25.6,67.2)	95.8(94.7,96.8)	15.5(8.0,26.0)	99.1(98.4,99.5)
	McGovern	169 (11.6)	91 (53.8)	6 (25.0)	9.4	75.0(53.3,90.2)	89.5(87.8,91.0)	10.7(6.4,16.3)	99.5(99.0,99.8)

BCVI = blunt cerebrovascular injury, CTA=computed tomography angiogram, CI = confidence interval, PPV = positive predictive value, NPV = negative predictive value. 95% confidence interval based on exact binomial distribution.

Q+A WITH ATOMAC+

WHAT DOES THE FUTURE OF BCVI SCREENING LOOK LIKE?


Radixact
TOMOTHERAPY
ACCURAY

J Pediatr Surg. 2023 Feb 28;S0022-3468(23)00176-8. doi: 10.1016/j.jpedsurg.2023.02.056.
Online ahead of print.

Hanging and Strangulation Injuries: An Institutional Review From a Level 1 Pediatric Trauma Center

Robert A Swendiman [1], Jack H Scaife [2], Kacey L Barnes [3], Teresa M Bell [3], Christopher M Roach [4], Rajiv R Iyer [5], Douglas L Brockmeyer [5], Katie W Russell [3]

Affiliations + expand

PMID: 37002058 DOI: 10.1016/j.jpedsurg.2023.02.056

SOI

Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.sciencedirect.com/journal/journal-of-pediatric-surgery

Updated APSA Guidelines for the Management of Blunt Liver and Spleen Injuries

Regan F. Williams [a,*], Harsh Grewal [b], Ramin Jamshidi [c], Bindi Naik-Mathuria [d], Mitchell Price [e], Robert T. Russell [f], Adam Vogel [g], David M. Notrica [c], Steven Stylianos [h], John Petty [i]

[a] *Le Bonheur Children's Hospital, 49 North Dunlap Avenue, Second Floor, Memphis, Tn, 38105, USA*
[b] *Drexel University College of Medicine, St Christopher's Children's Hospital, 160 East Erie Avenue, Philadelphia, PA, 19134, USA*
[c] *Phoenix Children's Hospital, 1919 E Thomas Road, Phoenix, Az, 85016, USA*
[d] *University of Texas Medical Branch, 712 Texas Avenue, Galveston, TX, 77555, USA*
[e] *Division of Pediatric Surgery -Staten Island University Hospital/CCMC/Northwell Health, 378 Seaview Ave., Lower Level. Staten Island, NY, 10305, USA*
[f] *Children's of Alabama, 1600 7th Avenue South, Lowder Bldg., Suite 300, Birmingham, AL, 35233, USA*
[g] *Department of Surgery, Texas Children's Hospital and Baylor College of Medicine, 6701 Fannin Street, Suite 1210, Houston, TX, 77030, USA*
[h] *Divsion of Pediatric Surgery, Columbia University Vagelos College of Physicians & Surgeons*
[i] *Section of Pediatric Surgery, Wake Forest University School of Medicine, Medical Center Boulevard, Winston–Salem, NC, 27157, USA*

Updated APSA Blunt Liver/Spleen Injury Guidelines

Admission

- **ICU Admission Indicators**
  - Abnormal vital signs after initial volume resuscitation
- **ICU**
  - Activity - Bedrest until vitals normal
  - Labs – q6hour 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 mL/kg bolus of isotonic IVF
  - Hemoglobin < 7
  - Signs of ongoing or recent bleeding
- **Angioembolization or Operative Exploration**
  - Signs of ongoing bleeding despite pRBC transfusion
  - Angioembolization is not indicated for contrast blush on admission CT without unstable vitals
  - Operative exploration may be indicated when additional procedures or information needed

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**
  - Routine imaging is not indicated in asymptomatic patients with low grade injuries
  - Consider imaging for ***symptomatic*** patients with prior high grade injuries

Admission

- **ICU Admission Indicators**
  - Abnormal vital signs after initial volume resuscitation
- **ICU**
  - Activity - Bedrest until vitals normal
  - Labs – q6hour CBC until vitals normal
  - Diet – NPO until vital signs normal and hemoglobin stable
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Procedures

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Set Free

- Based on clinical condition **NOT** injury severity (grade)
- Tolerating a diet
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- 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

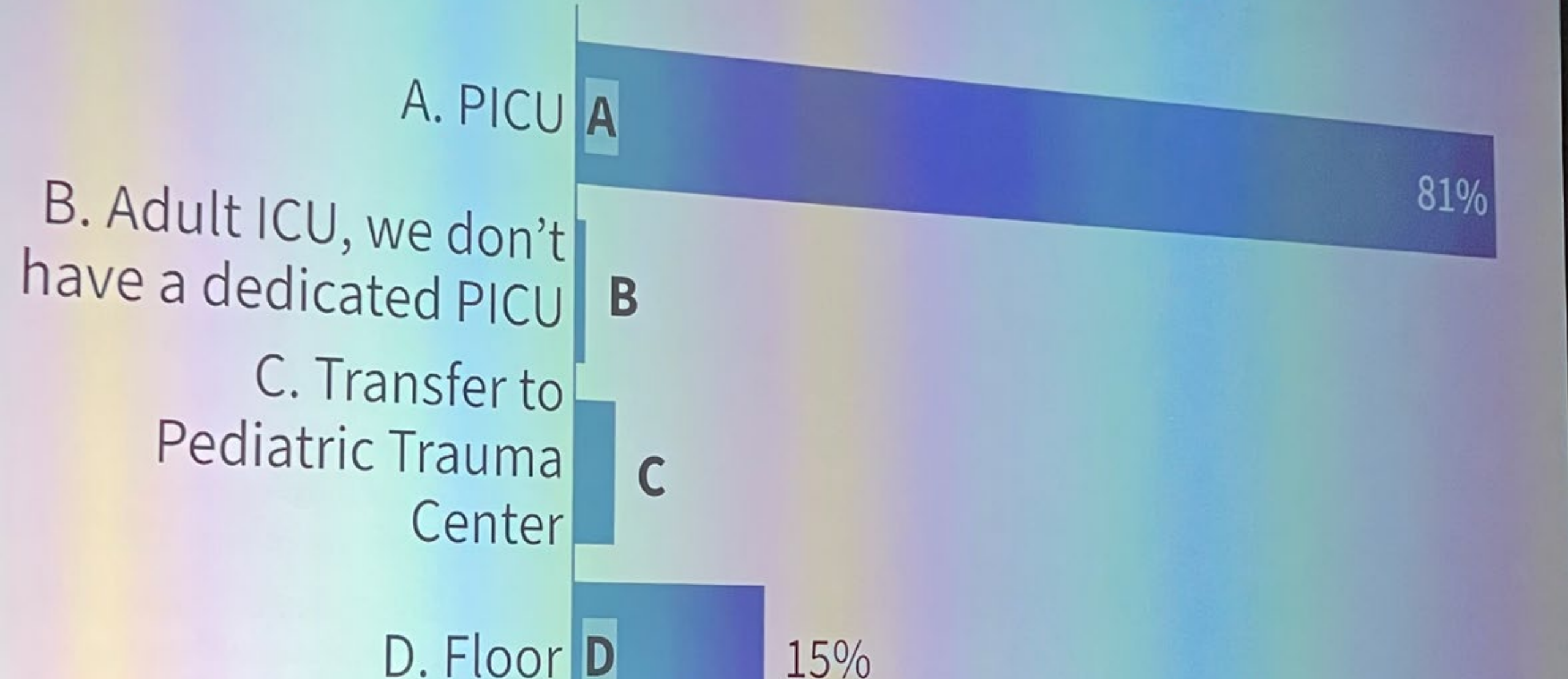
Follow up Imaging

- Risk of delayed complications following spleen and liver injuries is low
- Consider imaging for ***symptomatic*** patients with prior high grade injuries

Text VERITASARS265 to 37607 once to join, then A, B, C, or D

.com/veritasars265

Where will you admit this patient?



Q+A WITH AUDIENCE

HOW CAN WE FACILITATE CHANGE?

Contents lists available at ScienceDirect

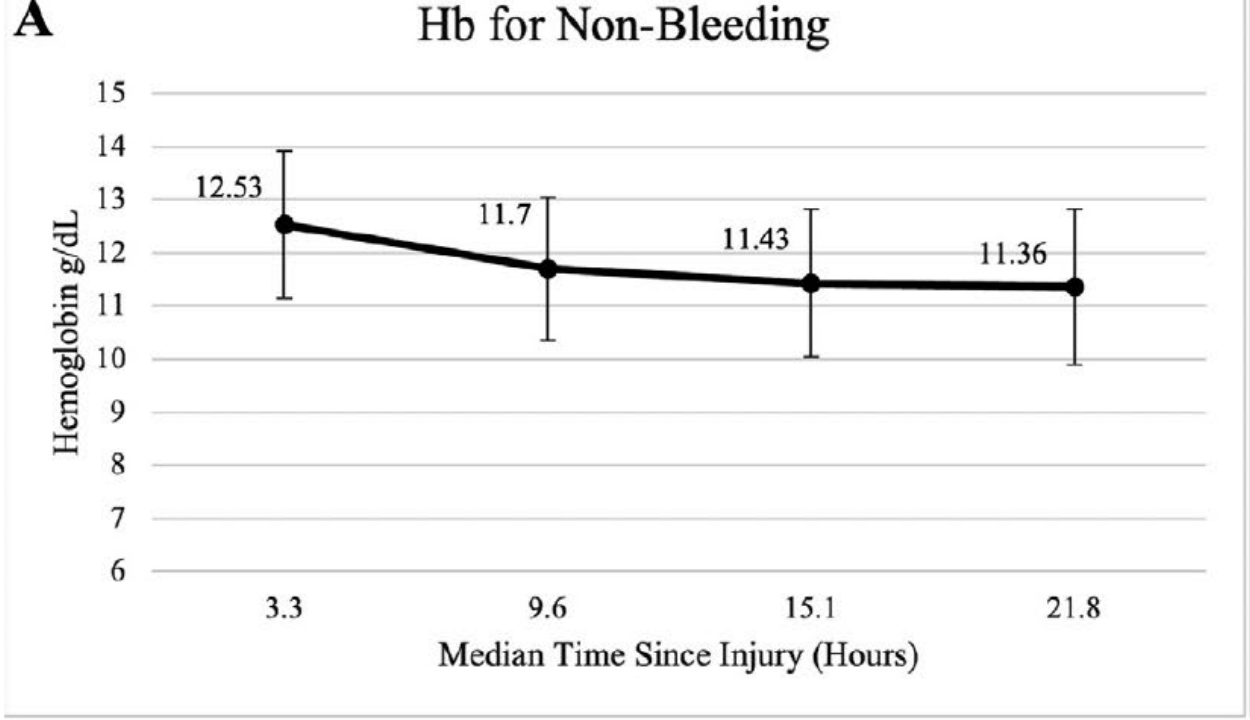
Journal of Pediatric Surgery

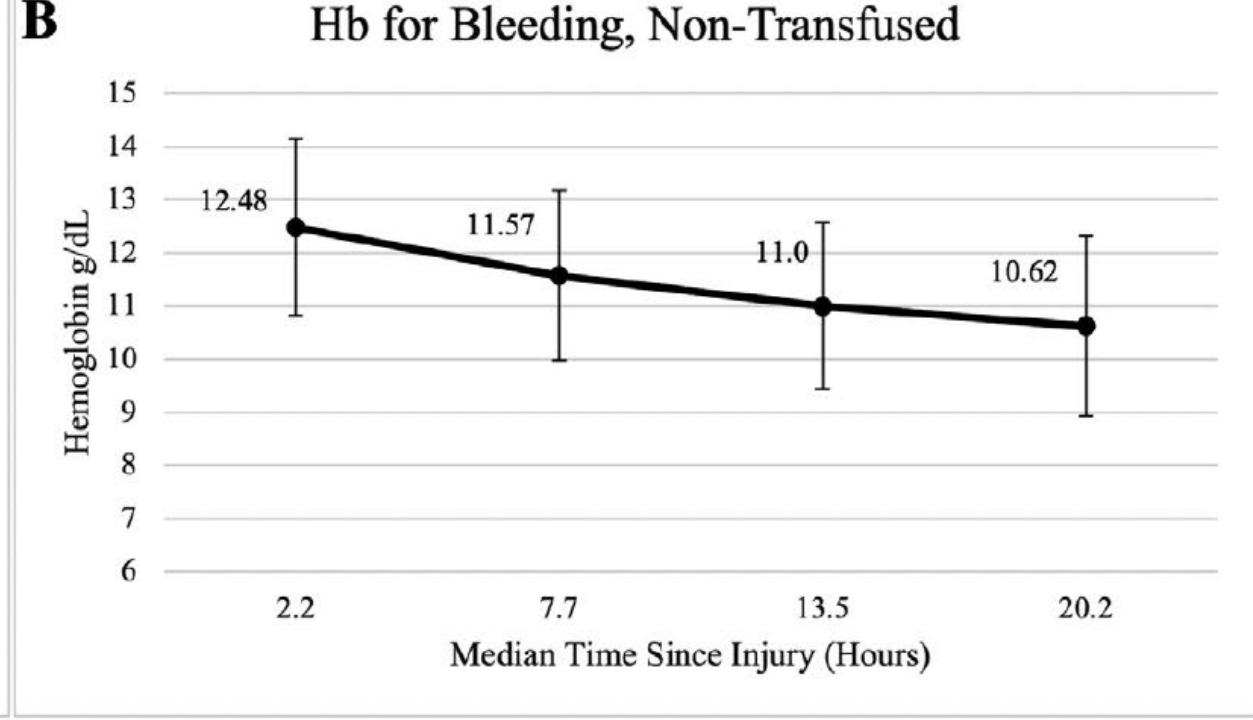
journal homepage: www.elsevier.com/locate/jpedsurg.org

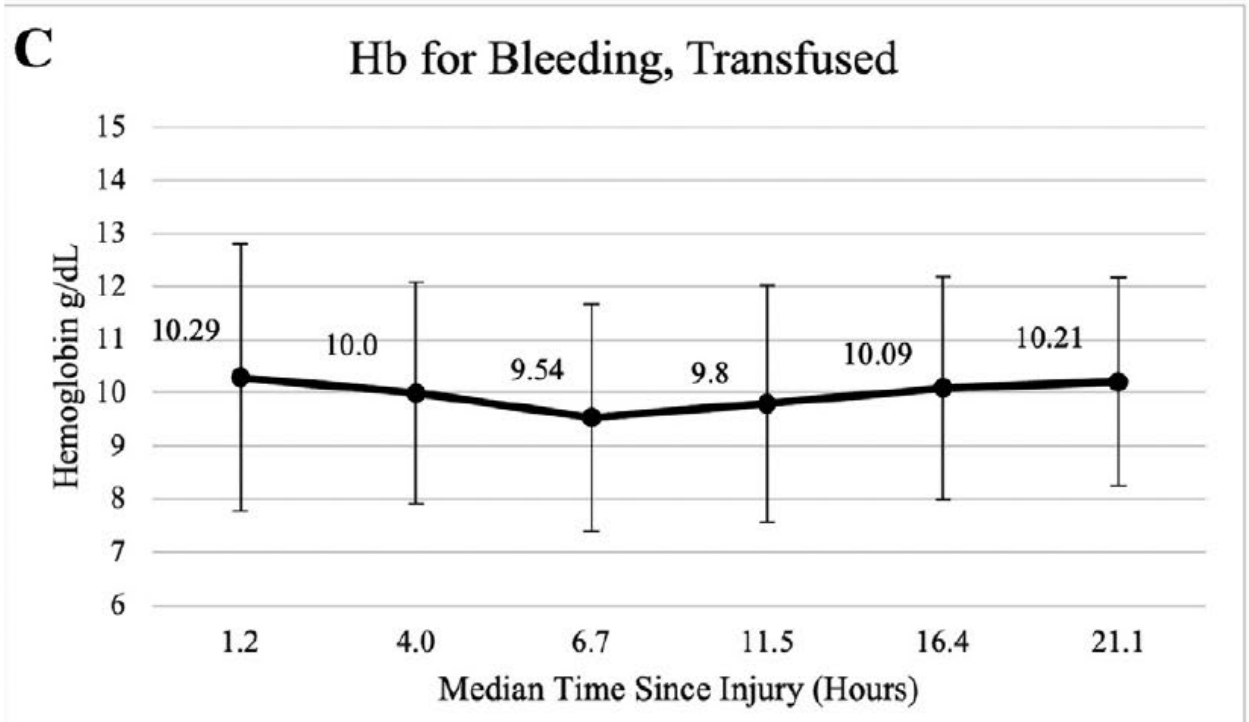
Hemodilution in pediatric trauma: Defining the expected hemoglobin changes in patients with liver and/or spleen injury: An ATOMAC+ secondary analysis

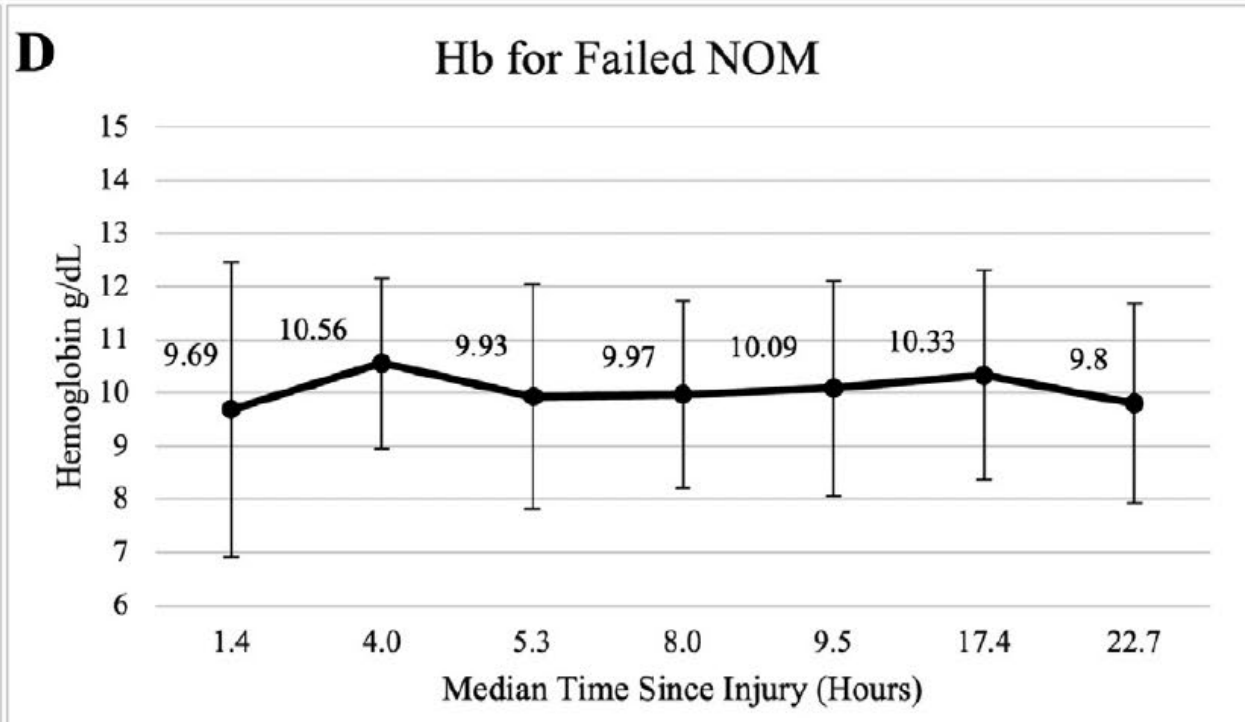
Rachael L. Stottlemyre[a,b], David M. Notrica[a,c,d,*], Aaron S. Cohen[b], Lois W. Sayrs[e], Jessica Naiditch[f], Shawn D. St. Peter[g], Charles M. Leys[h], Daniel J. Ostlie[a,h], R Todd Maxson[i], Todd Ponsky[f,j], James W. Eubanks III[k], Amina Bhatia[l], Cynthia Greenwell[m], Karla A. Lawson[f], Adam C. Alder[m], Jeremy Johnson[n], Erin Garvey[a,c,d]

[a] *Phoenix Children's, Phoenix, AZ 85016, United States*
[b] *University of Miami Miller School of Medicine, Miami, FL 33136, United States*
[c] *University of Arizona College of Medicine Phoenix, Phoenix, AZ 85004, United States*
[d] *Mayo Clinic College of Medicine and Science, Phoenix, AZ 85054, United States*
[e] *Children's Hospital of Orange County Research Institute, Orange, CA 92868, United States*
[f] *Dell Children's Medical Center, Austin, TX 78723, United States*
[g] *Children's Mercy Hospital, Kansas City, MO 64108, United States*
[h] *American Family Children's Hospital, Madison, WI 53792, United States*
[i] *Arkansas Children's Hospital, Little Rock, AR 72202, United States*
[j] *Akron Children's Hospital, Akron, OH 44308, United States*
[k] *Le Bonheur Children's Hospital, Memphis, TN 38103, United States*
[l] *Children's Healthcare of Atlanta, Atlanta, GA 30303, United States*
[m] *Children's Medical Center Dallas, Dallas, TX 75235, United States*
[n] *The Children's Hospital at OU Medical Center, Oklahoma City, OK 73104, United States*


A
Hb for Non-Bleeding
Hemoglobin g/dL
15
14
13
12
11
10
9
8
7
6
12.53
11.7
11.43
11.36
3.3
9.6
15.1
21.8
Median Time Since Injury (Hours)

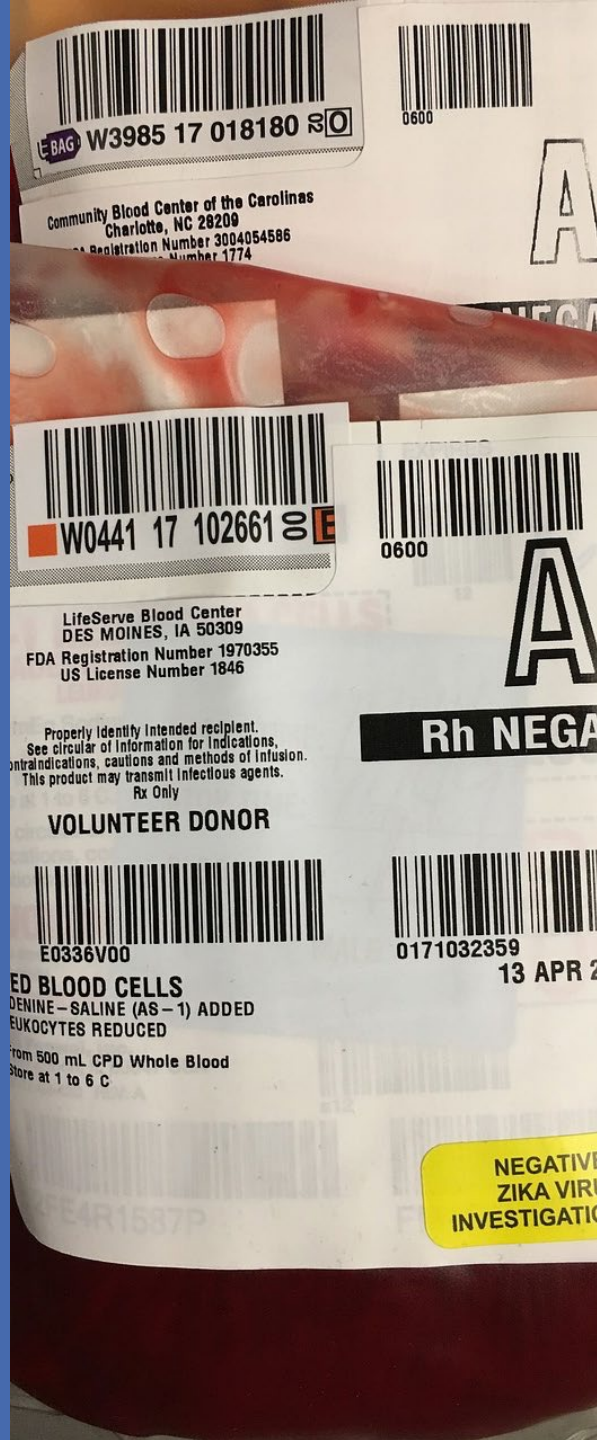

B
Hb for Bleeding, Non-Transfused
Hemoglobin g/dL
15
14
13
12
11
10
9
8
7
6
12.48
11.57
11.0
10.62
2.2
7.7
13.5
20.2
Median Time Since Injury (Hours)


C
Hb for Bleeding, Transfused
Hemoglobin g/dL
15
14
13
12
11
10
9
8
7
6
10.29
10.0
9.54
9.8
10.09
10.21
1.2
4.0
6.7
11.5
16.4
21.1
Median Time Since Injury (Hours)


D
Hb for Failed NOM
Hemoglobin g/dL
15
14
13
12
11
10
9
8
7
6
9.69
10.56
9.93
9.97
10.09
10.33
9.8
1.4
4.0
5.3
8.0
9.5
17.4
22.7
Median Time Since Injury (Hours)

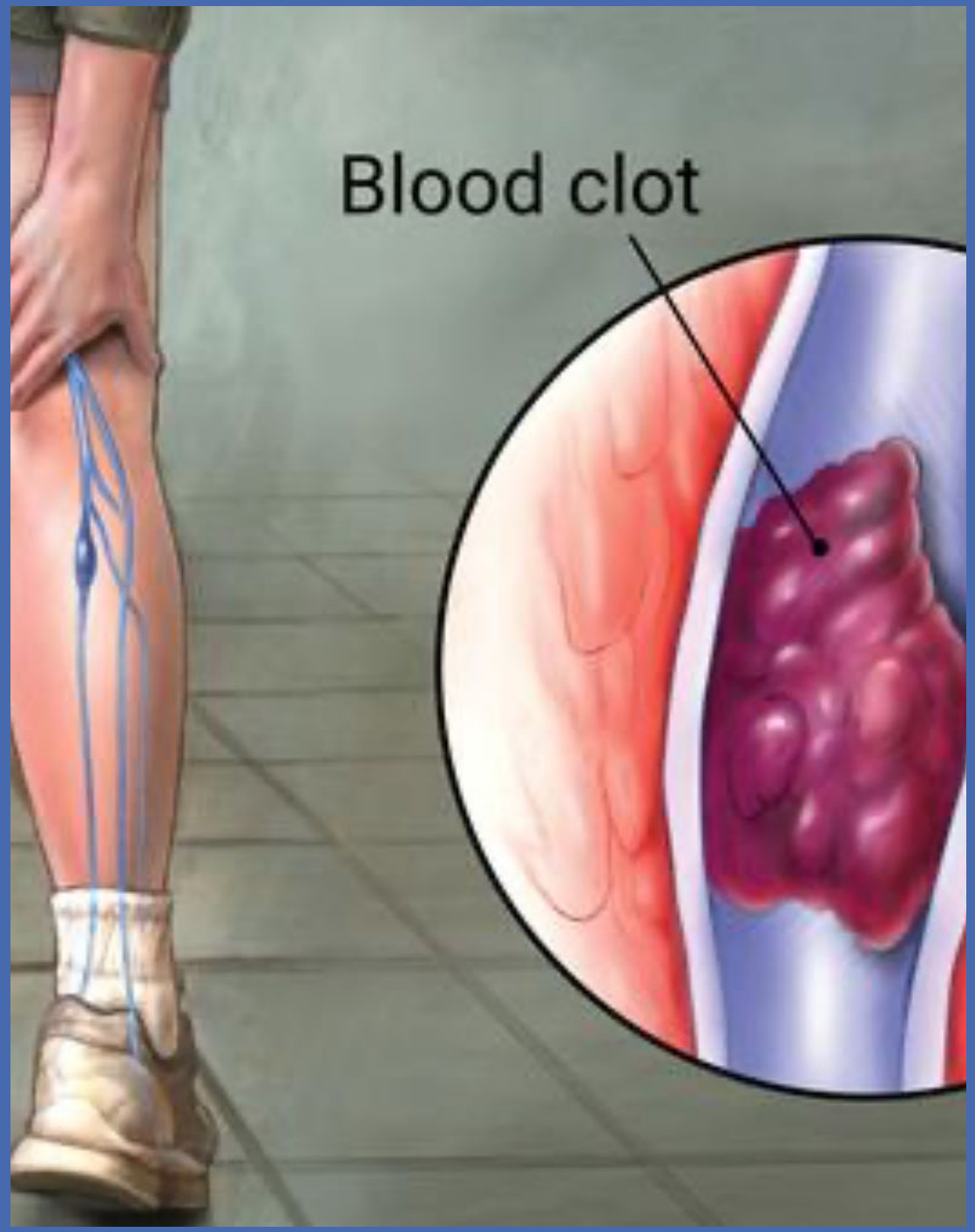
TAKE AWAY POINTS

1. HGB drop <2.18 g/dL in non bleeding patients
2. HGB drops not different between bleeding and non bleeding patients
3. Clinical judgement appears to be more important than HGB level
4. Initial HGB <9.25 14x risk fail NOM
5. Initial HGB <9.25 11x risk transfusion



Q+A WITH ATOMAC+

CAN WE STOP CHECKING SERIAL LABS IN FLOOR PATIENTS?



DVT

PTS Podium Paper 2021

Venous thromboembolic screening in pediatric trauma: A prospective cohort study of risk-stratified ultrasonography

Joseph Tobias, MD, Daniel F. Labuz, MD, Aaron Cunningham, MD, Alexandra Dixon, MD, Leigh Selesner, MD, Lori Moss, MN, Elizabeth Dewey, MS, Kristina M. Haley, DO, Erin Burns, MD, Martin Schreiber, MD, Rachel Wilson, PA-C, Nicholas A. Hamilton, MD, *and* **Mubeen A. Jafri, MD**, *Portland, Oregon*

A

Characteristic	Points
GCS	
Mild, 13–15	0
Moderate, 9–12	40
Severe, 3–8	34
Age category, y	
0	94
1-9	0
10-12	78
13-15	120
16-17	147
Female sex	4
Male sex	0
Intubation	97
Admission to ICU	171
Transfusion of blood products	58
Central venous catheter placement	61
Pelvic fracture	33
Lower-extremity fracture	36
Major surgery	150

B

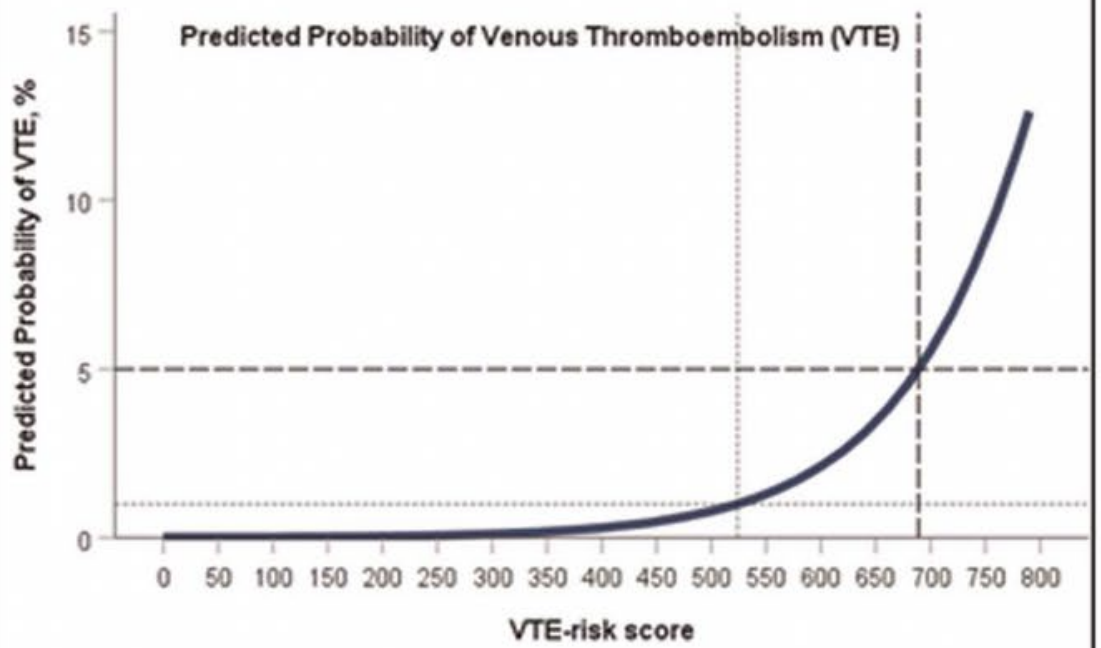


Figure 1. Venous thrombeombolism risk prediction algorithm. Developed by Connelly et al.[4] Ten common clinical variables, identifiable at admission, are weighted according to the strength of their association with the development of VTE in pediatric trauma patients. Risk scores are calculated from 0 to 797 (*x* axis). Maximum predicted risk is 12.7% (*y* axis). GCS, Glasgow Coma Scale.

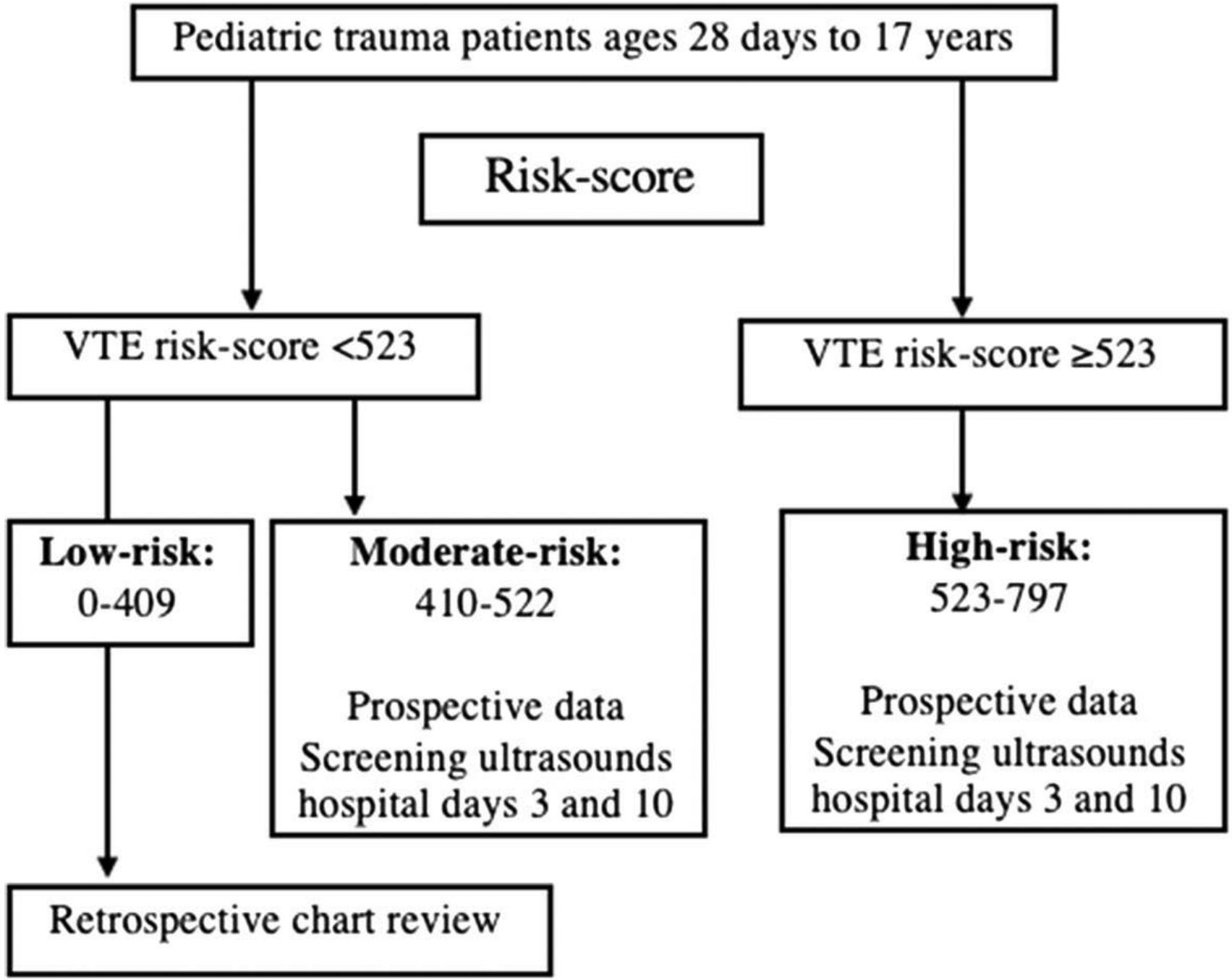

Pediatric trauma patients ages 28 days to 17 years
Risk-score
VTE risk-score <523
VTE risk-score ≥523
Low-risk:
0-409
Moderate-risk:
410-522
Prospective data
Screening ultrasounds
hospital days 3 and 10
High-risk:
523-797
Prospective data
Screening ultrasounds
hospital days 3 and 10
Retrospective chart review

TABLE 2. VTE Outcomes

Risk Score	Age	Sex	Trauma	VTE Location	AC	Mortality	PTS
High							
755	16	F	MVC	Bilateral femoral DVT and PE	N	Y	N/A
722	17	F	GSW	Calf DVT	N	Y	N/A
691	13	M	MVC	Brachial DVT*	1 mo	N	N
572	15	F	MVC	Calf DVT	1 wk	N	N/A
Moderate							
521	0.1	M	NAT	Femoral DVT*	3 mo	N	N
519	0.25	F	NAT	Femoral DVT*,**	N	Y	N/A
492	7	F	MVC	Calf DVT	3 mo	N	N
453	15	F	Drowning	Internal jugular DVT*,**	3 mo	N	N
441	10	M	Drowning	Iliofemoral DVT*	3 mo	N	N
430	16	M	MVC	Femoral DVT	3 mo	N	N
415	17	M	GSW	Internal jugular DVT*	N	N	N/A

*CVC-associated VTE.

**Symptomatic.

Demographic, clinical, and outcomes data for the 11 pediatric trauma patients who developed VTE during the study period.

AC, therapeutic anticoagulation; DVT, deep vein thrombosis; F, female; GSW, gunshot wound; M. male; MVC, motor vehicle collision; N, no; NAT, nonaccidental trauma; N/A, not applicable; PE, pulmonary embolism; Y, yes.

TABLE 3. Incidence of VTE

	Moderate Risk (n = 26) 0.3–0.99% VTE Risk		High Risk (n = 21) ≥1% VTE Risk
Median risk score (range, expected rate)	459 (415–521, 0.53%)		577 (530–755, 1.7%)
VTE	7/26 (26.9%)		4/21 (19.0%)
CVC associated		6/11 (54.5%)	
Asymptomatic		9/11 (81.8%)	
Number needed to screen		6.7	

Cases of VTE in our pediatric trauma population broken down by predicted risk, the presence of symptoms, and CVC association. A number needed to screen was calculated using the incidence of asymptomatic VTE and the incidence of symptomatic VTE.

Q+A WITH OREGON

SO, WHAT ARE YOU DOING NOW?

FIREARMS

Contents lists available at ScienceDirect

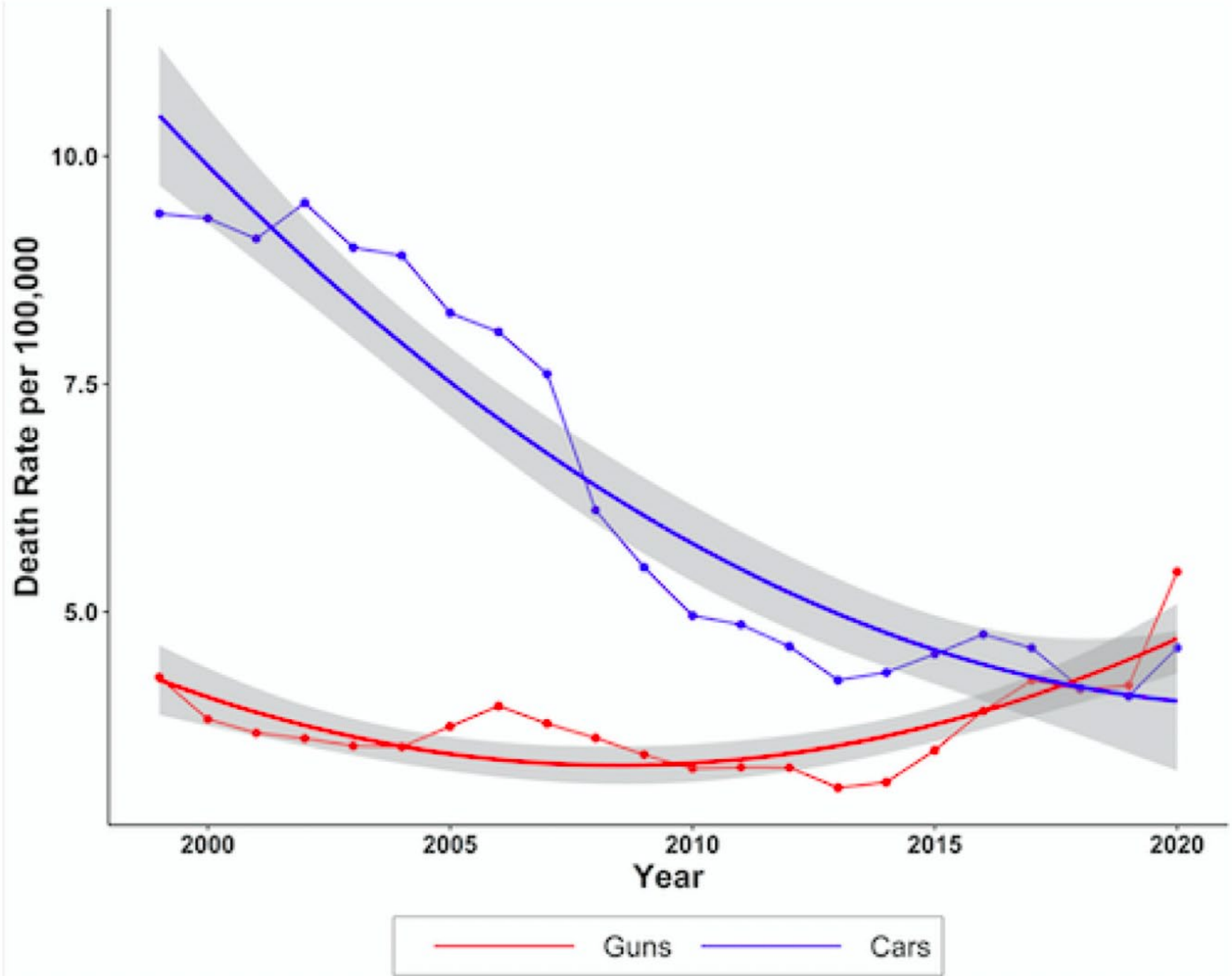
Journal of Pediatric Surgery

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

National trends in pediatric firearm and automobile fatalities☆,☆☆

Jenny Stevens[a,b,*], Kaci Pickett[c], Marina L. Reppucci[a,b], Margo Nolan[a,b], Steven L. Moulton[a,b]

[a] *Division of Pediatric Surgery, Department of Surgery, Children's Hospital Colorado, Aurora, CO, USA*
[b] *Department of Surgery, University of Colorado School of Medicine, Aurora, CO, USA*
[c] *The Center for Research in Outcomes for Children's Surgery, Center for Children's Surgery, Children's Hospital Colorado, Aurora, CO, USA*


Death Rate per 100,000
10.0
7.5
5.0
2000
2005
2010
2015
2020
Year
Guns
Cars

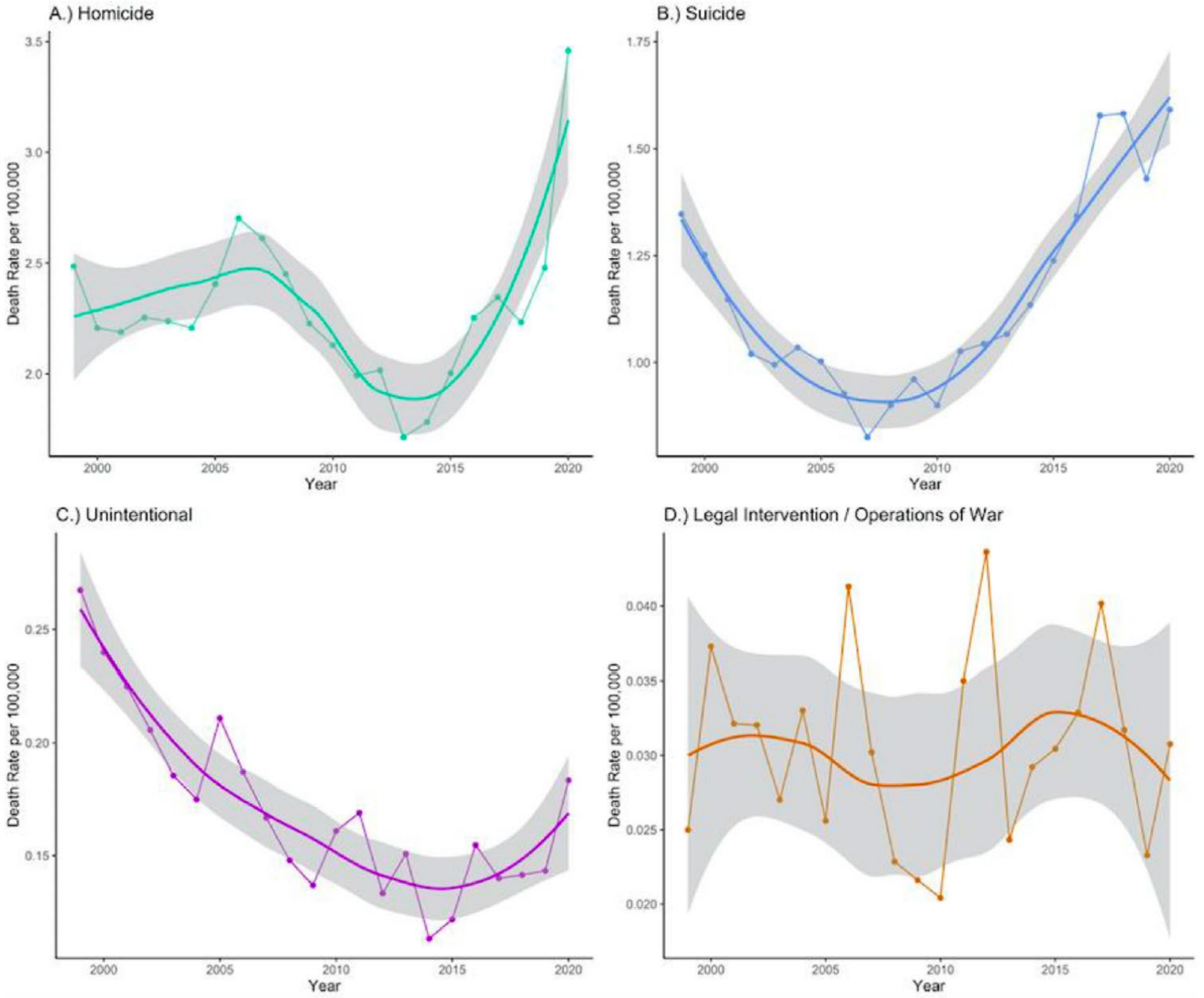
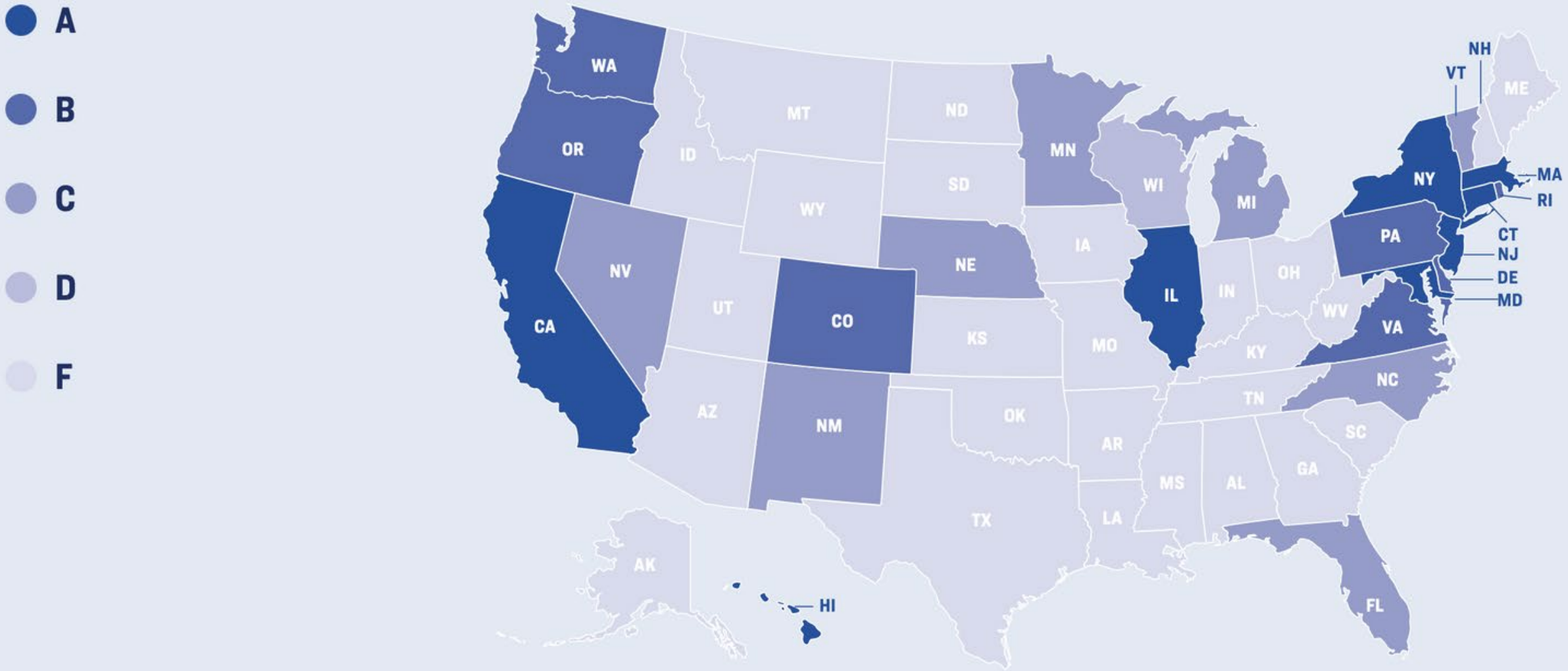


Fig. 2. National trends in pediatric firearm injury fatalities stratified by injury intent per 100,000 individuals using a LOESS best fit curve, 1999 – 2020.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MO
AR
LA
WI
IL
MI
IN
OH
KY
TN
MS
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GA
FL
SC
NC
VA
WV
PA
NY
VT
NH
ME
MA
RI
CT
NJ
DE
MD
AK
HI

Table 3
Estimated pediatric firearm injury fatality rates stratified by state gun law strength, 2014 – 2020.

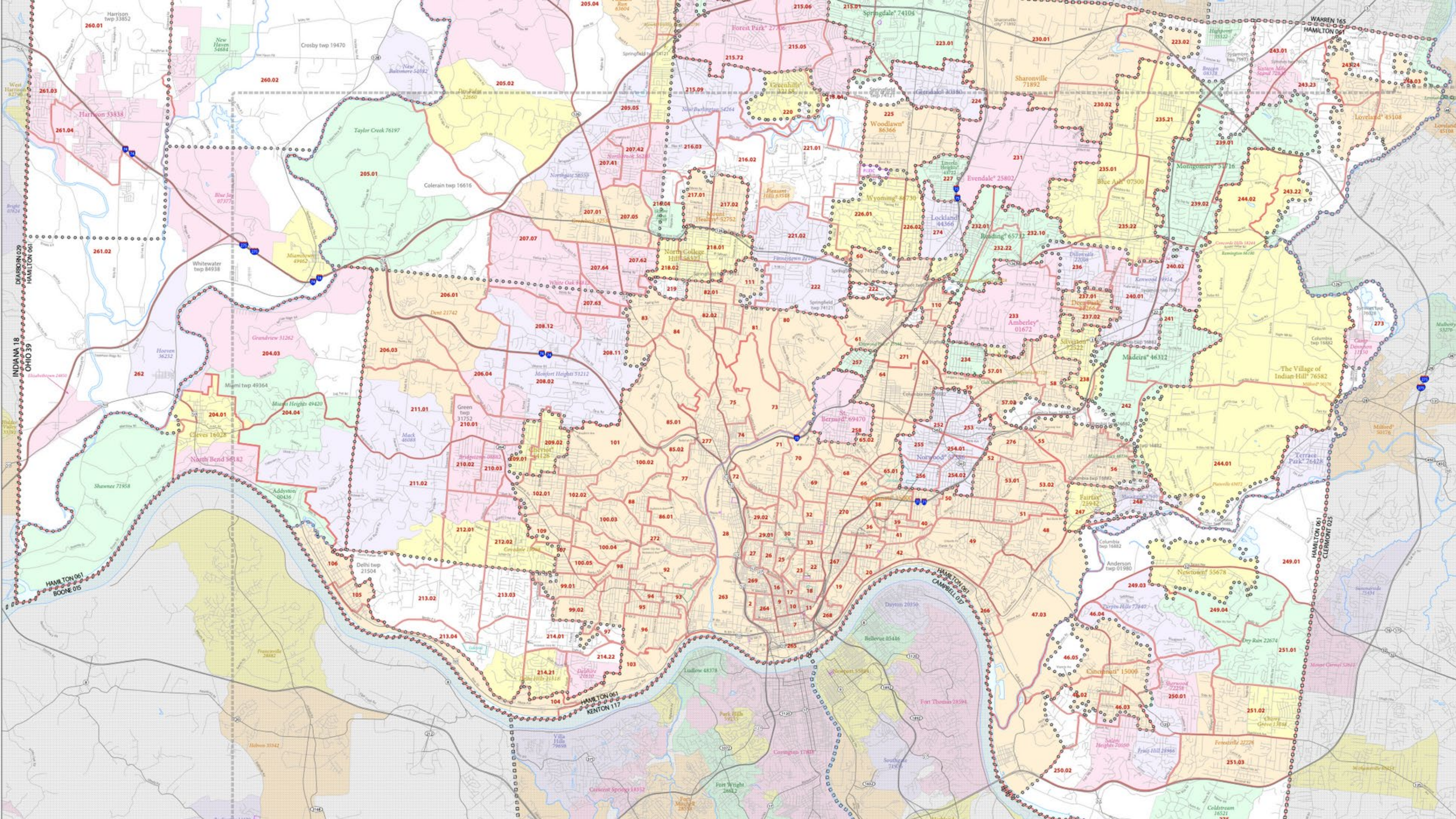
Estimate Year	Gun Law Strength				
	A (GPA = 4.0)	B (GPA = 3.0)	C (GPA = 2.0)	D (GPA = 1.0)	F (GPA = 0.0)
2014	1.92 (1.57, 2.35)	2.35 (2.02, 2.73)	2.87 (2.59, 3.17)	3.5 (3.32, 3.69)	4.28 (4.19, 4.37)
2019	2.93 (2.4, 3.58)	3.58 (3.09, 4.16)	4.38 (3.96, 4.84)	5.35 (5.08, 5.63)	6.54 (6.41, 6.66)
2020	3.19 (2.62, 3.9)	3.9 (3.36, 4.53)	4.77 (4.31, 5.27)	5.82 (5.53, 6.13)	7.11 (6.97, 7.26)

States with A grade have 55% lower firearm injury fatality rate compared to F grade

PTS PODIUM 2021

Relationships between socioeconomic deprivation and pediatric firearm-related injury at the neighborhood level

Stephen Trinidad, MD, Andrew Vancil, MS, Cole Brokamp, PhD, Suzanne Moody, MPA, CCRP, Dawne Gardner, MBA, Allison A. Parsons, PhD, Carley Riley, MD, MPP, MHS, Rashmi Sahay, MD, MS, Nicole Sofer, BS, Andrew F. Beck, MD, MPH, Richard A. Falcone, Jr., MD, MPH, MMM, *and* **Meera Kotagal, MD, MPH**, *Cincinnati, Ohio*



Harrison twp 33852
Crosby twp 19470
Forest Park 27706
Springdale 74104
Sharonville 71892
WARREN 165
HAMILTON 061
Harrison 33838
New Haven 54684
New Baltimore 54082
Greenhills 32158
Glendale 30436
Woodlawn 86366
Loveland 45108
Taylor Creek 76197
Colerain twp 16616
Evendale 25802
Blue Ash 07300
Montgomery 51716
Wyoming 86730
Lockland 44366
Reading 65732
Mount Healthy 52752
North College Hill 56350
Springfield twp 74121
Kenwood 39914
Amberley 01672
Deer Park
Silverton 72522
Madeira 46312
The Village of Indian Hill 76582
INDIANA 18
OHIO 39
DEARBORN 029
HAMILTON 061
Whitewater twp 84938
Miamitown 49462
Grandview 31262
Hooven 36232
Miami twp 49364
Miami Heights 49420
Cleves 16028
North Bend 56182
Monfort Heights 51212
Green twp 31752
Mack 46088
Cheviot 14128
Bridgetown 08868
St. Bernard 69470
Norwood 57386
Terrace Park 76428
Shawnee 71958
Addyston 00436
Delhi twp 21504
Fairfax 25942
Covedale 19064
Anderson twp 01980
Newtown 55678
Milford 50176
HAMILTON 061
BOONE 015
HAMILTON 061
KENTON 117
HAMILTON 061
CAMPBELL 037
HAMILTON 061
CLERMONT 025
Dayton 20350
Bellevue 05446
Ludlow 48378
Newport 55884
Fort Thomas 28594
Covington 17848
Park Hills 59235
Fort Wright 28612
Southgate 71976
Villa Hills 79698
Crescent Springs 18352
Francisville 28882
Hebron 35542
Cincinnati 15000
Dry Run 22674
Sherwood 72258
Forestville 27272
Salem Heights 70050
Fruit Hill 28966
Coldstream 16521
Mount Carmel 52612
Summerside 75452
Withamsville 85652
Camp Dennison 11850
Columbia twp 16682

SAN FRANCISCO EDITION

TAKE AWAY POINTS

1. Highest quintile of deprivation has 30x risk of firearm-related injury
2. Neighborhood deprivation also associated with assault intent
3. Highest quintile 25% all injuries
4. Highest quintile 57% firearm injuries
5. Highest quintile 75% firearm assaults

Q+A WITH AUDIENCE

SO, WHAT CAN WE DO?


WPTC
WESTERN PEDIATRIC
TRAUMA CONFERENCE
SUNDANCE UTAH
JULY 10th-12th, 2024