Decision Support Tools to Improve Pediatric Care

Jennifer Anders MD

Pediatric Emergency Medicine

Johns Hopkins University School of Medicine

Baltimore MD

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Care of Children in General EDs

- Majority of pediatric Emergency Care is in General EDs
- High acuity pediatric patients will present unexpectedly

- High risk; Low Frequency >>>> Anxiety

The Knowledge Translation Cycle and pediatric Emergency Care

Case 1: 3 year old with head injury

- 3 year old child fell from an open window to pavement (10 feet)
- Brief loss of consciousness
- Awake with normal mental status on arrival to emergency department
- Vomited once prior to arrival at emergency department
- Complains of headache/pain

Risk Stratification: Head Injury

Identification of children at very low risk of clinically-important brain injuries after head trauma: a prospective cohort study

*Nathan Kuppermann, James F Holmes, Peter S Dayan, John D Hoyle, Jr, Shireen M Atabaki, Richard Holubkov, Frances M Nadel, David Monroe, Rachel M Stanley, Dominic A Borgialli, Mohamed K Badawy, Jeff E Schunk, Kimberly S Quayle, Prashant Mahajan, Richard Lichenstein, Kathleen A Lillis, Michael G Tunik, Elizabeth S Jacobs, James M Callahan, Marc H Gorelick, Todd F Glass, Lois K Lee, Michael C Bachman, Arthur Cooper, Elizabeth C Powell, Michael J Gerardi, Kraig A Melville, J Paul Muizelaar, David H Wisner, Sally Jo Zuspan, J Michael Dean, Sandra L Wootton-Gorges, for the Pediatric Emergency Care Applied Research Network (PECARN)**

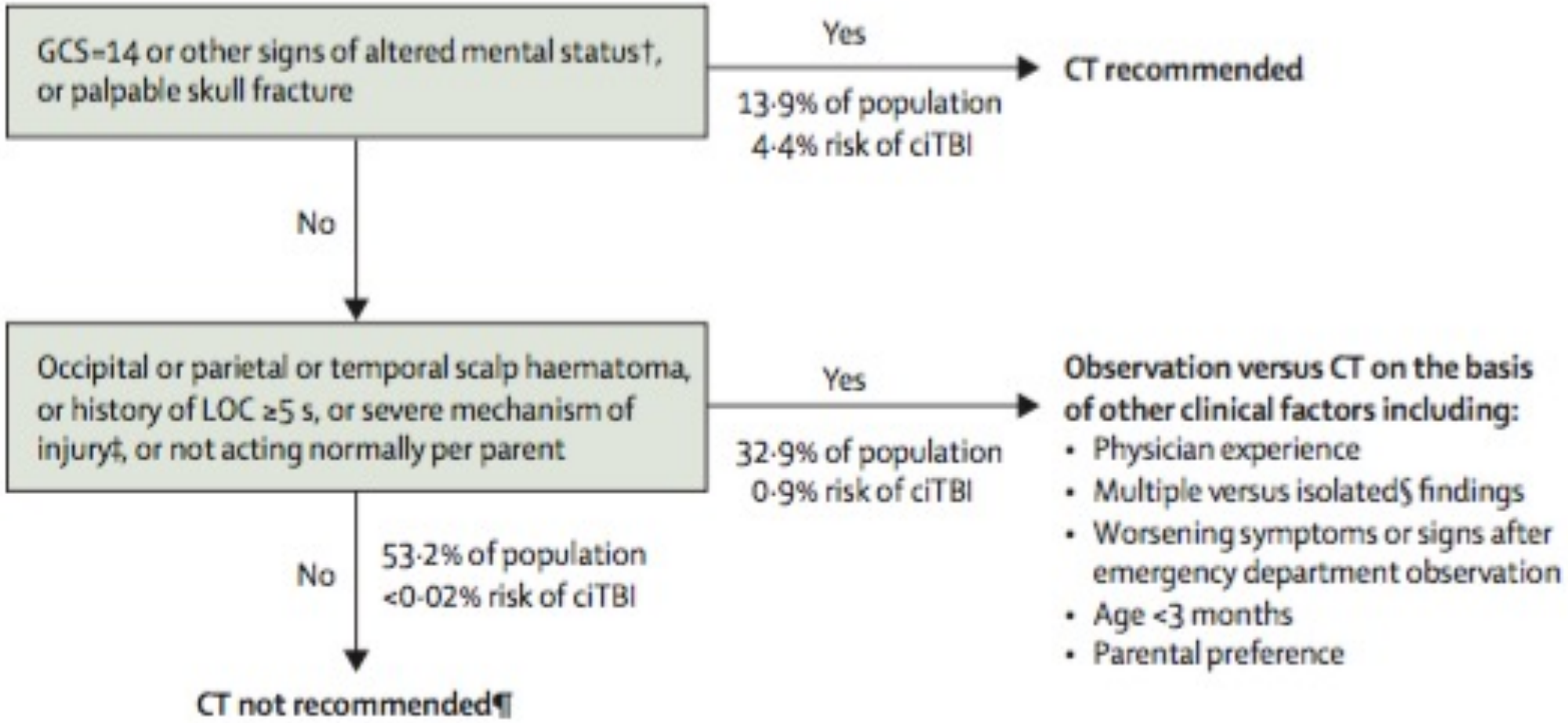
Lancet 2009; 374: 1160–70
Published Online
September 15, 2009
http://dx.doi.org/10.1016/S0140-6736(09)61558-0
This online publication has been corrected. The corrected

Summary

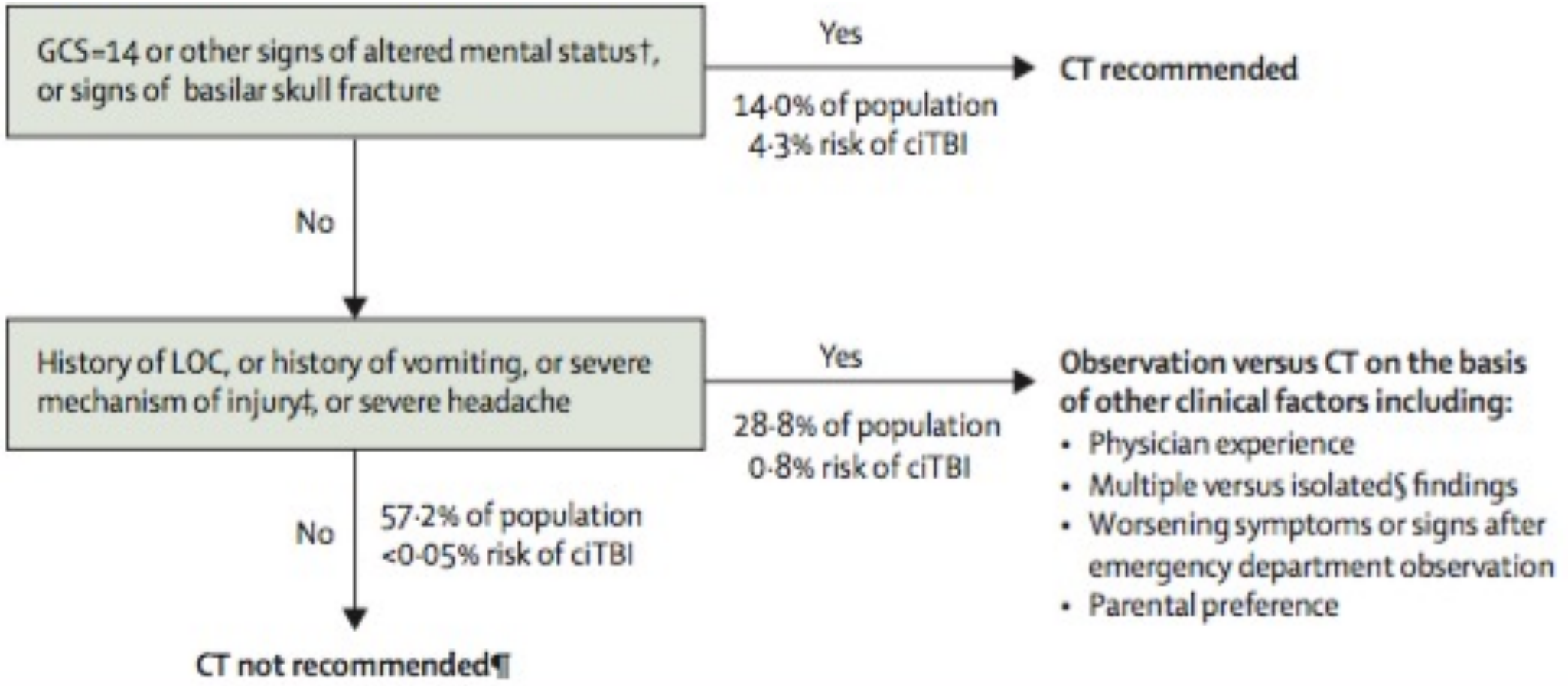
Background CT imaging of head-injured children has risks of radiation-induced malignancy. Our aim was to identify children at very low risk of clinically-important traumatic brain injuries (ciTBI) for whom CT might be unnecessary.

Methods We enrolled patients younger than 18 years presenting within 24 h of head trauma with Glasgow Coma Scale scores of 14–15 in 25 North American emergency departments. We derived and validated age-specific prediction rules for ciTBI (death from traumatic brain injury, neurosurgery, intubation >24 h, or hospital admission ≥2 nights).

PECARN Head Rule: Child < 2 years



PECARN Head Rule: 2 years and older

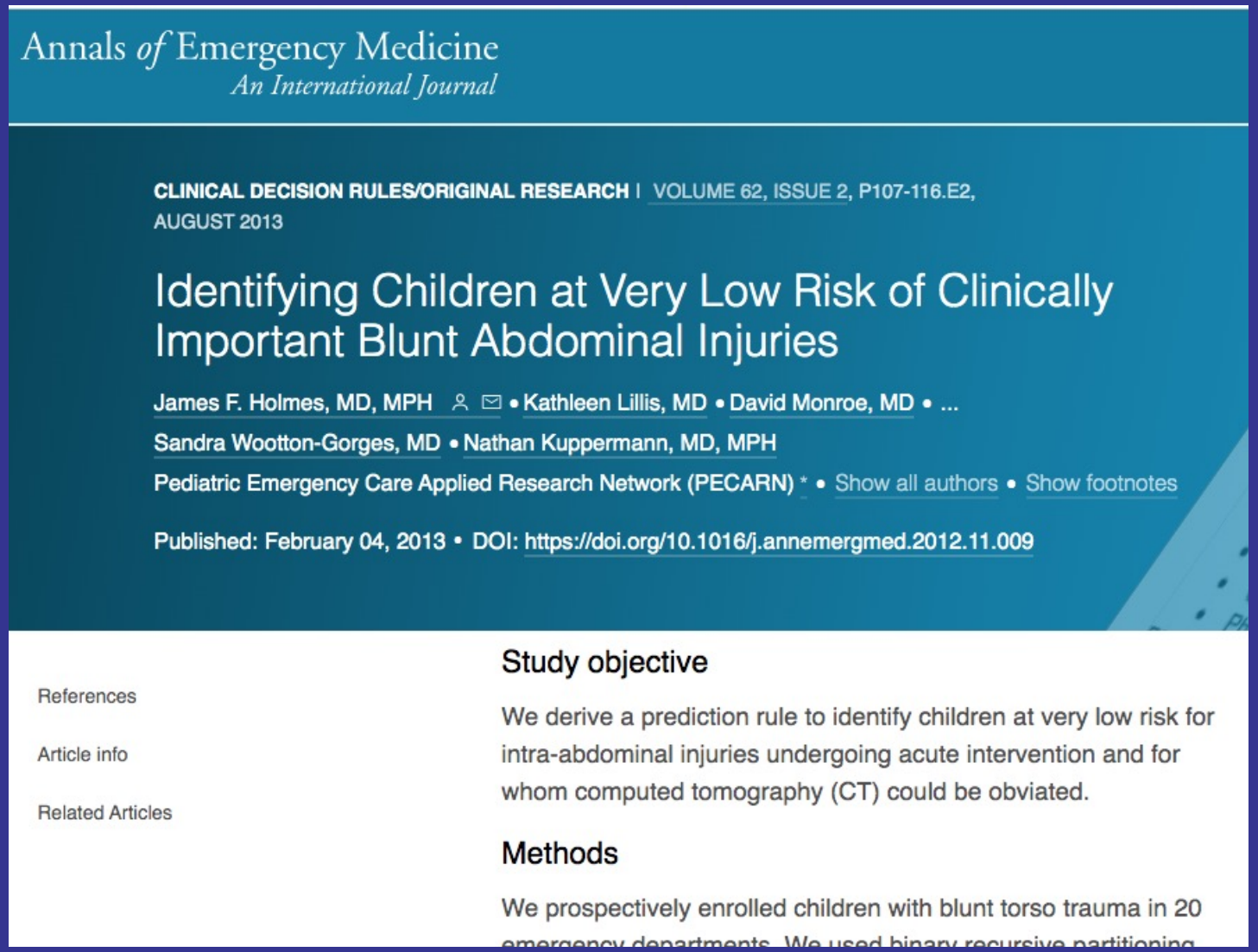


Case 2: Intra-Abdominal Injury

Case 2: Abdominal Injury

- 13 year old girl is brought to the ED by her parent after a bicycle crash that happened one hour prior
- She was thrown forward from and struck in the abdomen by the handlebar of her bicycle
- Since time of injury she has noted mild pain to the upper abdomen
- She is not vomiting
- Her vital signs are normal for age

PECARN Intra-Abdominal Injury Rule



Annals *of* Emergency Medicine
An International Journal

CLINICAL DECISION RULES/ORIGINAL RESEARCH | VOLUME 62, ISSUE 2, P107-116.E2, AUGUST 2013

Identifying Children at Very Low Risk of Clinically Important Blunt Abdominal Injuries

James F. Holmes, MD, MPH • Kathleen Lillis, MD • David Monroe, MD • ...
Sandra Wootton-Gorges, MD • Nathan Kuppermann, MD, MPH
Pediatric Emergency Care Applied Research Network (PECARN) * • Show all authors • Show footnotes

Published: February 04, 2013 • DOI: https://doi.org/10.1016/j.annemergmed.2012.11.009

References

Article info

Related Articles

Study objective

We derive a prediction rule to identify children at very low risk for intra-abdominal injuries undergoing acute intervention and for whom computed tomography (CT) could be obviated.

Methods

We prospectively enrolled children with blunt torso trauma in 20 emergency departments. We used binary recursive partitioning

PECARN Intra-Abdominal Injury Rule

- https://www.mdcalc.com/calc/3971/pecarn-pediatric-intra-abdominal-injury-iai-algorithm

Case 3: MVC with neck injury

Case 3: MVC with neck pain

- 4 year old boy BIB EMS with cervical collar after MVC
- Reported 10 MPH rear-end crash; child was appropriately restrained
- No LOC
- Awake and interactive on arrival

What do you do about that cervical collar?

PECARN C-spine Rule

Annals *of* Emergency Medicine
An International Journal

PEDIATRICS/ORIGINAL RESEARCH | VOLUME 58, ISSUE 2, P145-155, AUGUST 2011

Factors Associated With Cervical Spine Injury in Children After Blunt Trauma

Julie C. Leonard, MD, MPH • Nathan Kuppermann, MD, MPH • Cody Olsen, MS • ...
Getachew Teshome, MD, MPH • David M. Jaffe, MD Pediatric Emergency Care Applied Research Network * •
Show all authors • Show footnotes

Published: November 01, 2010 • DOI: https://doi.org/10.1016/j.annemergmed.2010.08.038

References

Article info

Related Articles

Study objective

Cervical spine injuries in children are rare. However, immobilization and imaging for potential cervical spine injury after trauma are common and are associated with adverse effects. Risk factors for cervical spine injury have been developed to safely limit immobilization and radiography in adults, but not in children. The purpose of our study is to identify risk factors associated with cervical spine injury in children after blunt trauma.

Methods

PECARN C-spine rule

- Altered mental status
- Focal Neurologic Deficits
- Substantial torso Injury
- Torticollis
- Neck pain (complaint)
- High risk MVC
- Axial Load injury (e.g. diving)
- Predisposing conditions (e.g. Down syndrome)

Lenoard et al, Ann Em Med, 2011

Case 4: 8 yo boy with abdominal pain

Case 4: 8 yo boy with Abdominal Pain

- 8 year old boy with 1 day of pain
- Periumbilical --> RLQ
- Poor appetite
- Nausea, no vomiting, no diarrhea
- No fever
- Exam: alert, non toxic appearance. Abdomen tender to palpation in RUQ and RLQ. No rebound. No Rovsing/obturator/psoas sign. When he jumps, complains of pain and locates pain to RLQ.

Pediatric Appendicitis Score

- RLQ tenderness
- Anorexia
- Fever
- Nausea or Vomiting
- Tenderness to RLQ
- Leukocytosis > 10,000
- ANC > 7,500
- Migration of pain to RLQ

Interpretation

- 0-3 points = unlikely appendicitis
- 4-6 points = possible appendicitis
- 7-10 points = likely appendicitis

Samuel, 2002, Journal of Pediatric Surgery

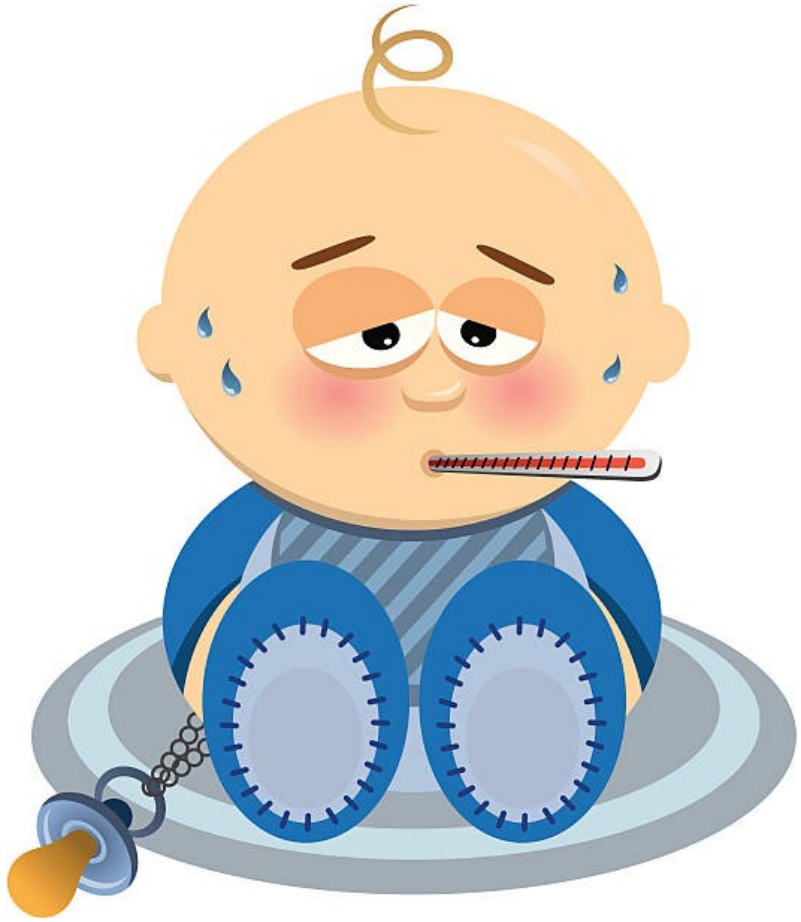
Pediatric Appendicitis Score

- https://www.mdcalc.com/calc/3926/pediatric-appendicitis-score-pas

PARc

- https://www.mdcalc.com/calc/10201/pediatric-appendicitis-risk-calculator-parc#use-cases

Case 5: Predicting UTI Risk



Case 5: UTI prediction

- 7 month old boy presents to the ED for evaluation of fever x 2 days
- Maximum temperature 39.3C
- No respiratory symptoms
- Emesis x 2, no diarrhea
- No clinical history or exam with focus of infection
- Circumcised


UTIcalc

UTICalc Version 3.0

For children 2 to 23 months of age.

Probability of UTI based on clinical characteristics

Enter child's clinical characteristics below (all fields are required)

Age < 12 months	Yes	No
Maximum temperature ≥ 39 °C (i.e., 102.2°F)	Yes	No
History of UTI*	Yes	No
Female or uncircumcised male	Yes	No
Other fever source**	Yes	No
Duration of fever ≥ 48 hrs	Yes	No
Probability of UTI		

Calculate Clear

*Parent reported or documented history of UTI

**Other fever source can include (but is not limited to): acute otitis media, upper respiratory tract infection (i.e., any cough or congestion), gastroenteritis, pneumonia, meningitis, bronchiolitis, and viral syndrome.

UTICalc

- Children < 2 years of age
- Estimate risk of UTI and advise +/- on urine sample
- Revise estimate with UA results

Find it at

https://uticalc.pitt.edu/

UTICalc Version 3.0

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Probability of UTI	2.82%	

Calculate Clear

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Probability of UTI based on clinical & laboratory characteristics

Only enter available test results; leave fields blank for test results that are not available.

Nitrite	○ Yes	○ No
Leukocyte esterase	--	
WBC/mm^3 (If not available, leave blank. Do not substitute WBC/hpf)		
Bacteria on Gram stain (If not done leave blank; do not substitute bacteria on urinalysis) Clear stain selection	○ Yes	○ No
Probability of UTI		

Calculate Clear

How can an ED Director utilize these?

- Staff Education
- Quality Improvement
- Develop Local Guidelines
- Embed into EMR
- Communication with families
- Shared Decision Making

How is this going to improve my ED?

- Staff confidence/competency
- Adherence to best practices/CPG for pediatric care
- Improve patient satisfaction
- Enhance MDM for billing
- Improve ED throughput