

Clinical Calculators: Friend or Foe?



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Presented by UCA Affiliate

HIPPO
EDUCATION



Ross Cohen, DO



Kelly Heidepriem, MD

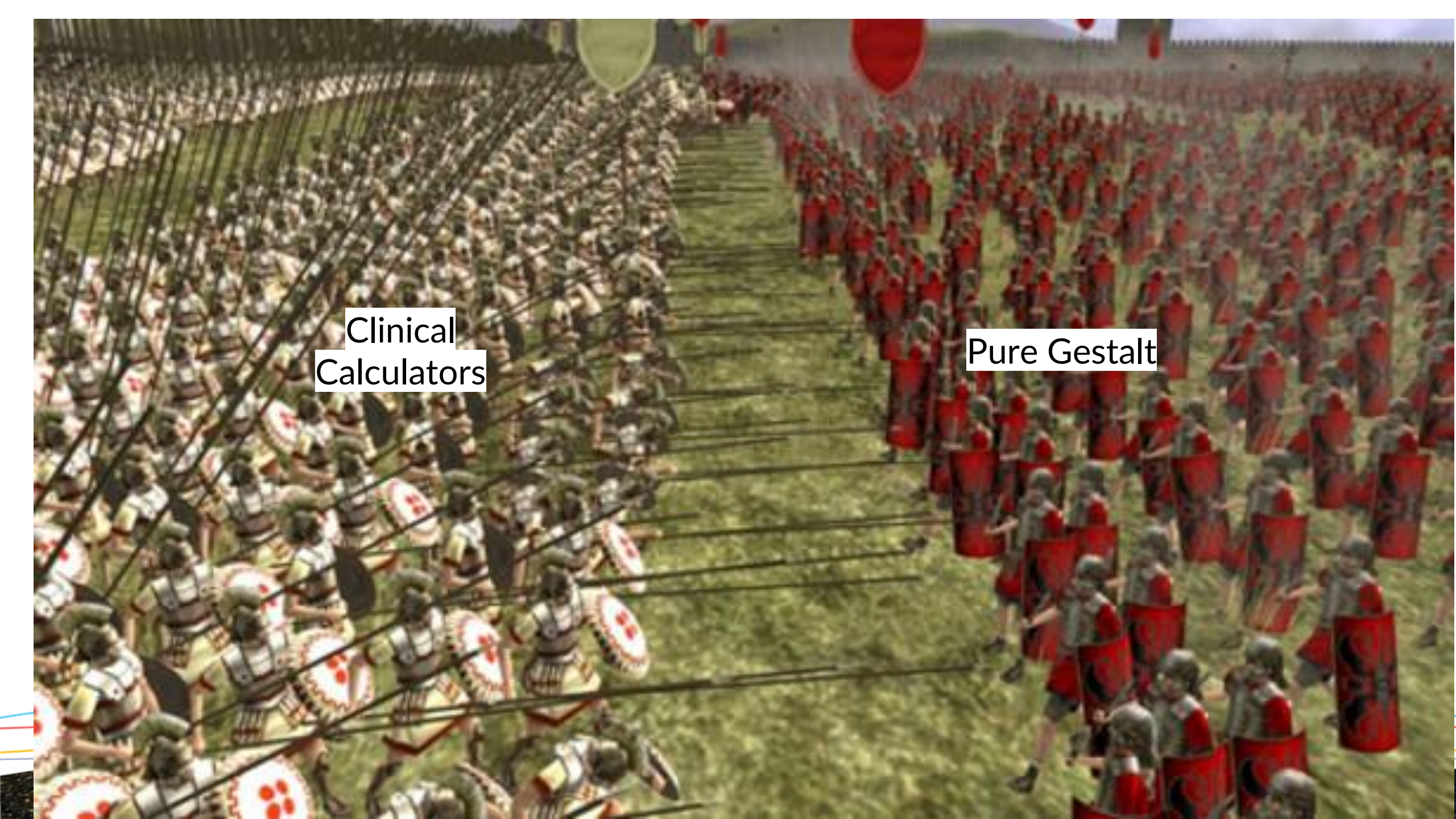


Braeden Johnson, MD



Arti Patel, MD

How many times a day do you formally pull up a clinical calculator or something like MDCalc on a shift?



Clinical
Calculators

Pure Gestalt



R. Austin Farneth, MD 🏳️‍🌈 🏳️‍⚧️ 🇺🇸
@FarnethRA



Medical calculators and scores are not a surrogate for good clinical decision making.

1:44 PM · Feb 4, 2023 · **66** Views



"The plural of anecdote is not data"



Howie Mell, MD, MPH, FACEP (he/him)
@DrHowieMell



While we'd all like to believe that we worship at the Altar of EBM, the reality is that many decisions get made in the Lounge of Anecdotes.

3:25 PM · Dec 2, 2016



Seth Trueger ✓
@MDaware

it's not anecdote

it's small batch, artisanal data



What factors make a good clinical calculator?

Easy to use

Objective

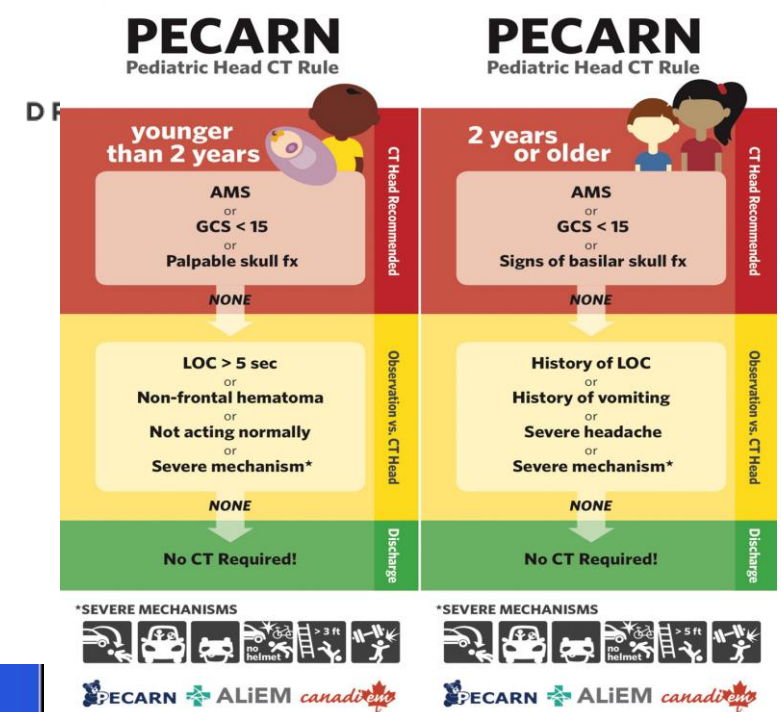
**Know which demographic
it's used for**

Validated Studies

**Recommendations are
clear**

The HEART Score for Chest Pain Patients in the ED		
History	<ul style="list-style-type: none"> Highly Suspicious Moderately Suspicious Slightly or Non-Suspicious 	<ul style="list-style-type: none"> 2 points 1 point 0 points
ECG	<ul style="list-style-type: none"> Significant ST-Depression Nonspecific Repolarization Normal 	<ul style="list-style-type: none"> 2 points 1 point 0 points
Age	<ul style="list-style-type: none"> ≥ 65 years > 45 - < 65 years ≤ 45 years 	<ul style="list-style-type: none"> 2 points 1 point 0 points
Risk Factors	<ul style="list-style-type: none"> ≥ 3 Risk Factors or History of CAD 1 or 2 Risk Factors No Risk Factors 	<ul style="list-style-type: none"> 2 points 1 point 0 points
Troponin	<ul style="list-style-type: none"> ≥ 3 x Normal Limit > 1 - < 3 x Normal Limit ≤ Normal Limit 	<ul style="list-style-type: none"> 2 points 1 point 0 points
Risk Factors: DM, current or recent (<one month) smoker, HTN, HLP, family history of CAD, & obesity		
Score 0 – 3: 2.5% MACE over next 6 weeks → Discharge Home		
Score 4 – 6: 20.3% MACE over next 6 weeks → Admit for Clinical Observation		
Score 7 – 10: 72.7% MACE over next 6 weeks → Early Invasive Strategies		

Centor Score for Strep	
Temperature > 38 C	Yes
Cough	Yes
Adenopathy	Yes
Swelling	Yes
Age	≥45
Score: 2 - Culture. Treat only if culture positive	
Link to reference publication	



MD CALC Search "QT interval" or "QT"

NEXUS Criteria for C-Spine Imaging

Clears patients from cervical spine fracture clinically, without imaging.

When to Use | Pearls/Pitfalls | Why Use

Focal neurologic deficit present	No 0	Yes +1
Midline spinal tenderness present	No 0	Yes +1
Altered level of consciousness present	No 0	Yes +1
Intoxication present	No 0	Yes +1

PERC Criteria
Age < 50
Pulse < 100 BPM
SaO2 > or = 95%
No hemoptysis
No estrogen use
No surgery/trauma requiring hospitalization within 4 weeks
No prior VTE
No unilateral leg swelling

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THE URGENT CARE CONVENTION

PECARN



<1%

PECARN

Pediatric Head CT Rule

younger
than 2 years



AMS
or
GCS < 15
or
Palpable skull fx

NONE

CT Head Recommended

PECARN

Pediatric Head CT Rule

2 years
or older



AMS
or
GCS < 15
or
Signs of basilar skull fx

NONE

CT Head Recommended

HIPPO

PECARN

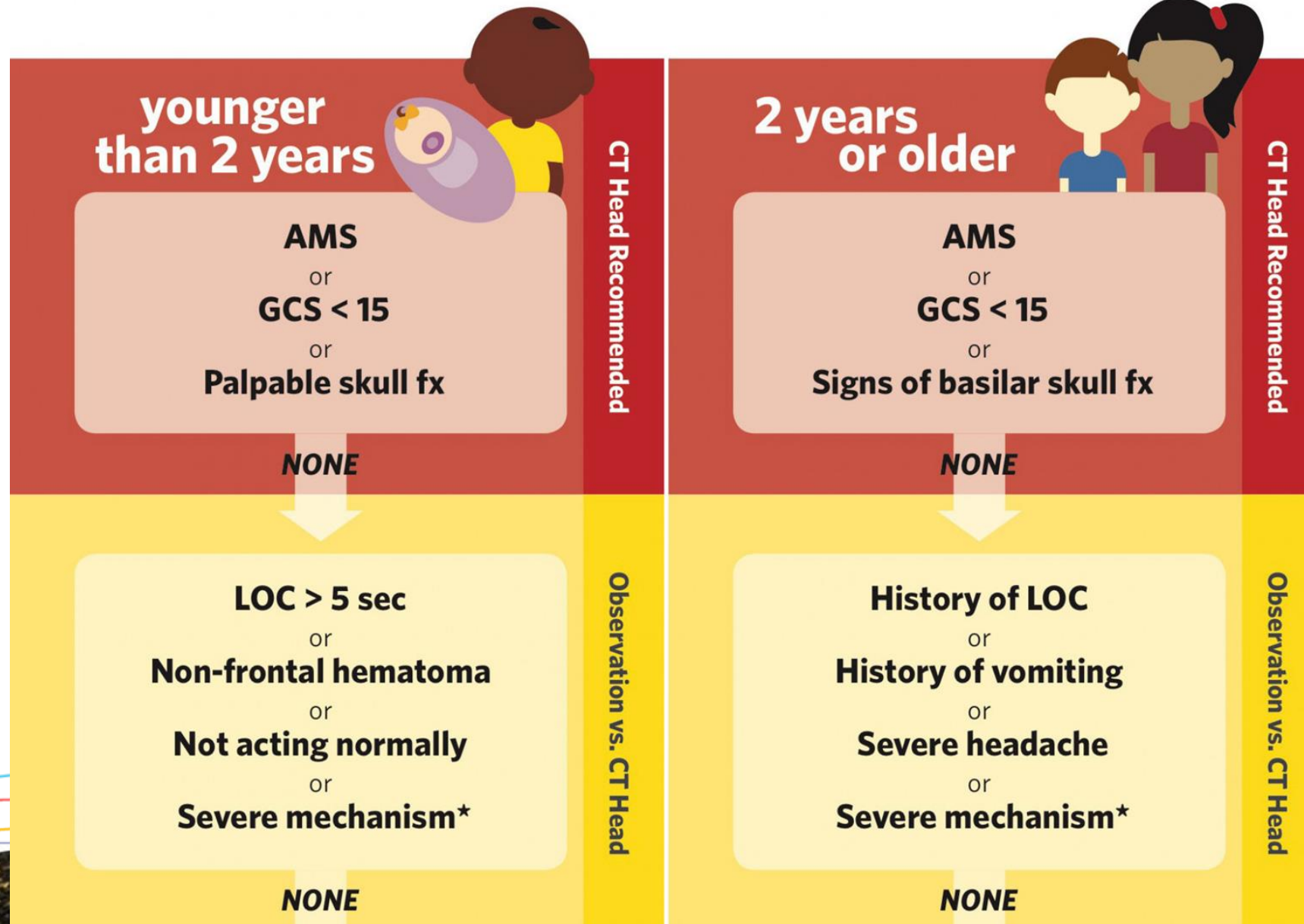
Pediatric Head CT Rule

PECARN

Pediatric Head CT Rule

ING **CHANGE2023**

THE URGENT CARE CONVENTION



CASE 1



CASE 1

- 6 yo female
- No LOC, GCS 15 and no signs of basilar skull fracture
- No headache
- 4 episodes of vomitus

HIPPO

CASE 1

Mom is concerned about the persistent vomiting...

SHOULD YOU BE?

HIPPO

Age

<2 Years

≥2 Years

GCS ≤14 or signs of basilar skull fracture or signs of AMS

AMS: Agitation, somnolence, repetitive questioning, or slow response to verbal communication

No

Yes

History of LOC or history of vomiting or severe headache or severe mechanism of injury

Motor vehicle crash with patient ejection, death of another passenger, or rollover; pedestrian or bicyclist without helmet struck by a motorized vehicle; falls of more than 1.5m/5ft; head struck by a high-impact object

No

Yes

PECARN recommends observation over imaging, depending on provider comfort; 0.9% risk of clinically important Traumatic Brain Injury.

Consider the following when making imaging decisions: Physician experience, worsening signs/symptoms during observation period, age <3 months, parent preference, multiple vs. isolated findings: patients with certain isolated findings (i.e., no other findings suggestive of TBI), such as isolated LOC, isolated headache, isolated vomiting, and certain types of isolated scalp hematomas in infants >3 months have ciTBI risk substantially <1%.

Copy Results 

Next Steps 

Decision Aid 





Hematomas



<6 months

>3 cm

Non Frontal

Risk	Serious TBI	Action
LOW RISK	<0.05 %	Discharge
INTERMEDIATE RISK	0.9 %	Shared Decision Making
HIGH RISK	4.3 %	CT Scan



CASE 2

CASE 2

- 10 yo male
- No helmet
- No LOC, GCS 15 and no signs of basilar skull fracture
- No headache or vomiting

HIPPO

CASE 2

Occurred **24** hours ago



CASE 2

**Mom is concerned about the
mechanism...**

SHOULD YOU BE?

HIPPO

Age

<2 Years

≥2 Years

GCS ≤14 or signs of basilar skull fracture or signs of AMS

AMS: Agitation, somnolence, repetitive questioning, or slow response to verbal communication

No

Yes

History of LOC or history of vomiting or severe headache or severe mechanism of injury

Motor vehicle crash with patient ejection, death of another passenger, or rollover; pedestrian or bicyclist without helmet struck by a motorized vehicle; falls of more than 1.5m/5ft; head struck by a high-impact object

No

Yes

Age

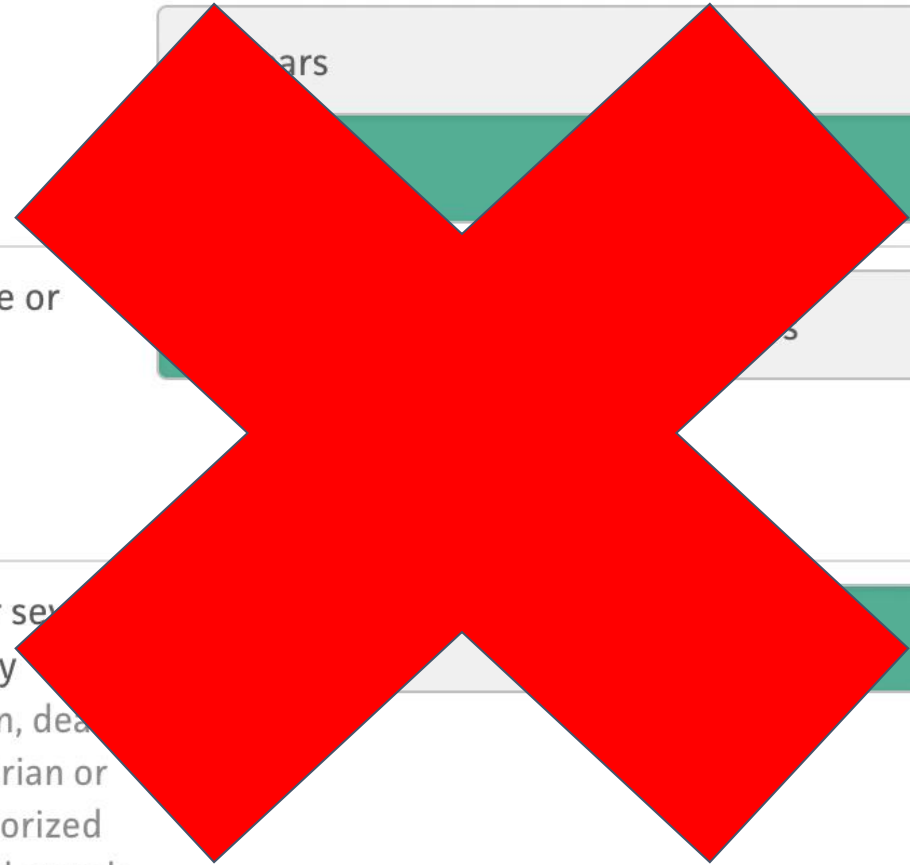
Years

GCS ≤ 14 or signs of basilar skull fracture or signs of AMS

AMS: Agitation, somnolence, repetitive questioning, or slow response to verbal communication

History of LOC or history of vomiting or severe headache or severe mechanism of injury

Motor vehicle crash with patient ejection, death of another passenger, or rollover; pedestrian or bicyclist without helmet struck by a motorized vehicle; falls of more than 1.5m/5ft; head struck by a high-impact object



Delayed Presentation

- **PECARN rule does NOT apply**
- **Non frontal hematoma = BAD**
- **Overall 3x higher incidence of TBI**



Takeaways

- Layer secondary features to create pre-test probability rather than anchoring on one symptom alone
- Delayed presentation = higher risk for TBI
- Non frontal scalp hematomas = **BADNESS**

HEAR(t)



HEART Score for Major Cardiac Events ☆

Predicts 6-week risk of major adverse cardiac event.

INSTRUCTIONS

Use in patients ≥ 21 years old presenting with symptoms suggestive of ACS. Do not use if new ST-segment elevation ≥ 1 mm or other new EKG changes, hypotension, life expectancy less than 1 year, or noncardiac medical/surgical/psychiatric illness determined by the provider to require admission.

When to Use ▾

Pearls/Pitfalls ▾

Why Use ▾

History

Slightly suspicious	0
Moderately suspicious	+1
Highly suspicious	+2

EKG

1 point: No ST deviation but LBBB, LVH, repolarization changes (e.g. digoxin); 2 points: ST deviation not due to LBBB, LVH, or digoxin

Normal	0
Non-specific repolarization disturbance	+1
Significant ST deviation	+2

Age

<45 0	45-64 +1	≥ 65 +2
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Risk factors

Risk factors: HTN, hypercholesterolemia, DM, obesity (BMI > 30)

No known risk factors	0
1-2 risk factors	+1

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THE URGENT CARE CONVENTION

HEAR

Case 1



- 43 year old male
- No past medical history
- Midsternal chest pain for 10 minutes yesterday
- Does not smoke and no known family history of CVD before 65
- EKG unremarkable

History

Slightly suspicious	0
Moderately suspicious	+1
Highly suspicious	+2

EKG

1 point: No ST deviation but LBBB, LVH, repolarization changes (e.g. digoxin); 2 points: ST deviation not due to LBBB, LVH, or digoxin

Normal	0
Non-specific repolarization disturbance	+1
Significant ST deviation	+2

Age

<45 0	45-64 +1	≥65 +2
-----------------	----------	--------

Risk factors

Risk factors: HTN, hypercholesterolemia, DM, obesity (BMI >30 kg/m²), smoking (current, or smoking cessation ≤3 mo), positive family history (parent or sibling with CVD before age 65); atherosclerotic disease: prior MI, PCI/CABG, CVA/TIA, or peripheral arterial disease

No known risk factors	0
1-2 risk factors	+1
≥3 risk factors or history of atherosclerotic disease	+2

Initial troponin

Use local, regular sensitivity troponin assays and corresponding cutoffs

≤normal limit	0
1-3× normal limit	+1
>3× normal limit	+2

Case 2

- 39 year old female
- Left sided, non radiating chest pain that lasted 2 seconds 5 hours PTA while at rest and reproducible with palpation
- No family history
- Former smoker but quit 2 months ago
- No shortness of breath
- EKG unremarkable



When to Use ▾

Pearls/Pitfalls ▾

Why Use ▾

History

Slightly suspicious	0
Moderately suspicious	+1
Highly suspicious	+2

EKG

1 point: No ST deviation but LBBB, LVH, repolarization changes (e.g. digoxin); 2 points: ST deviation not due to LBBB, LVH, or digoxin

Normal	0
Non-specific repolarization disturbance	+1
Significant ST deviation	+2

Age

<45 0	45-64 +1	≥65 +2
-----------------	----------	--------

Risk factors

Risk factors: HTN, hypercholesterolemia, DM, obesity (BMI >30 kg/m²), smoking (current, or smoking cessation ≤3 mo), positive family history (parent or sibling with CVD before age 65); atherosclerotic disease: prior MI, PCI/CABG, CVA/TIA, or peripheral arterial disease

No known risk factors	0
1-2 risk factors	+1
≥3 risk factors or history of atherosclerotic disease	+2

Initial troponin

Use local, regular sensitivity troponin

≤normal limit	0
1-3× normal limit	+1

Case 3



- 44-year-old male
- Left-sided non radiating chest pain at rest 4 hours PTA at rest
- Father had MI at 60
- EKG has no ischemic changes
- No known PMH and blood pressure is 150/82

When to Use ▾

Pearls/Pitfalls ▾

Why Use ▾

History

Slightly suspicious 0

Moderately suspicious +1

Highly suspicious +2

EKG

1 point: No ST deviation but LBBB, LVH, repolarization changes (e.g. digoxin); 2 points: ST deviation not due to LBBB, LVH, or digoxin

Normal 0

Non-specific repolarization disturbance +1

Significant ST deviation +2

Age

<45 0

45-64 +1

≥65 +2

Risk factors

Risk factors: HTN, hypercholesterolemia, DM, obesity (BMI >30 kg/m²), smoking (current, or smoking cessation ≤3 mo), positive family history (parent or sibling with CVD before age 65); atherosclerotic disease: prior MI, PCI/CABG, CVA/TIA, or peripheral arterial disease

No known risk factors 0

1-2 risk factors +1

≥3 risk factors or history of atherosclerotic disease +2

Initial troponin

Use local, regular sensitivity troponin

≤normal limit 0

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THE URGENT CARE CONVENTION

PERC

PERC Rule for Pulmonary Embolism ☆

Rules out PE if no criteria are present and pre-test probability is $\leq 15\%$.

When to Use ▾	Pearls/Pitfalls ▾	Why Use ▾
Age ≥ 50	No 0	Yes +1
HR ≥ 100	No 0	Yes +1
O₂ sat on room air $< 95\%$	No 0	Yes +1
Unilateral leg swelling	No 0	Yes +1
Hemoptysis	No 0	Yes +1
Recent surgery or trauma Surgery or trauma ≤ 4 weeks ago requiring treatment with general anesthesia	No 0	Yes +1
Prior PE or DVT	No 0	Yes +1
Hormone use Oral contraceptives, hormone replacement or estrogenic hormones	No 0	Yes +1



Simplified Wells Score

- Clinical signs and symptoms of DVT (minimum of leg swelling and pain elicited upon palpation of deep veins) 1
- No alternative diagnosis more likely than PE 1
- Heart rate >100 1
- Immobilization at least 3 days or surgery in previous 4 weeks 1
- Previous DVT or PE 1
- Haemoptysis 1
- Malignancy (on treatment, treated in last 6 months or palliative) 1

> 1
PE likely

≤ 1
PE unlikely

Pulmonary Embolism Rule-out Criteria (PERC)

- Age <50 years
- Pulse <100 beats per minute
- SaO₂ >95% on room air
- No haemoptysis
- No exogenous oestrogen use
- No prior venous thromboembolism
- No surgery or trauma requiring hospitalisation within the past 4 weeks
- No unilateral leg swelling

Imaging
recommended

Quantitative
Whole Blood
D dimer assay

NO
to
ANY

+ve

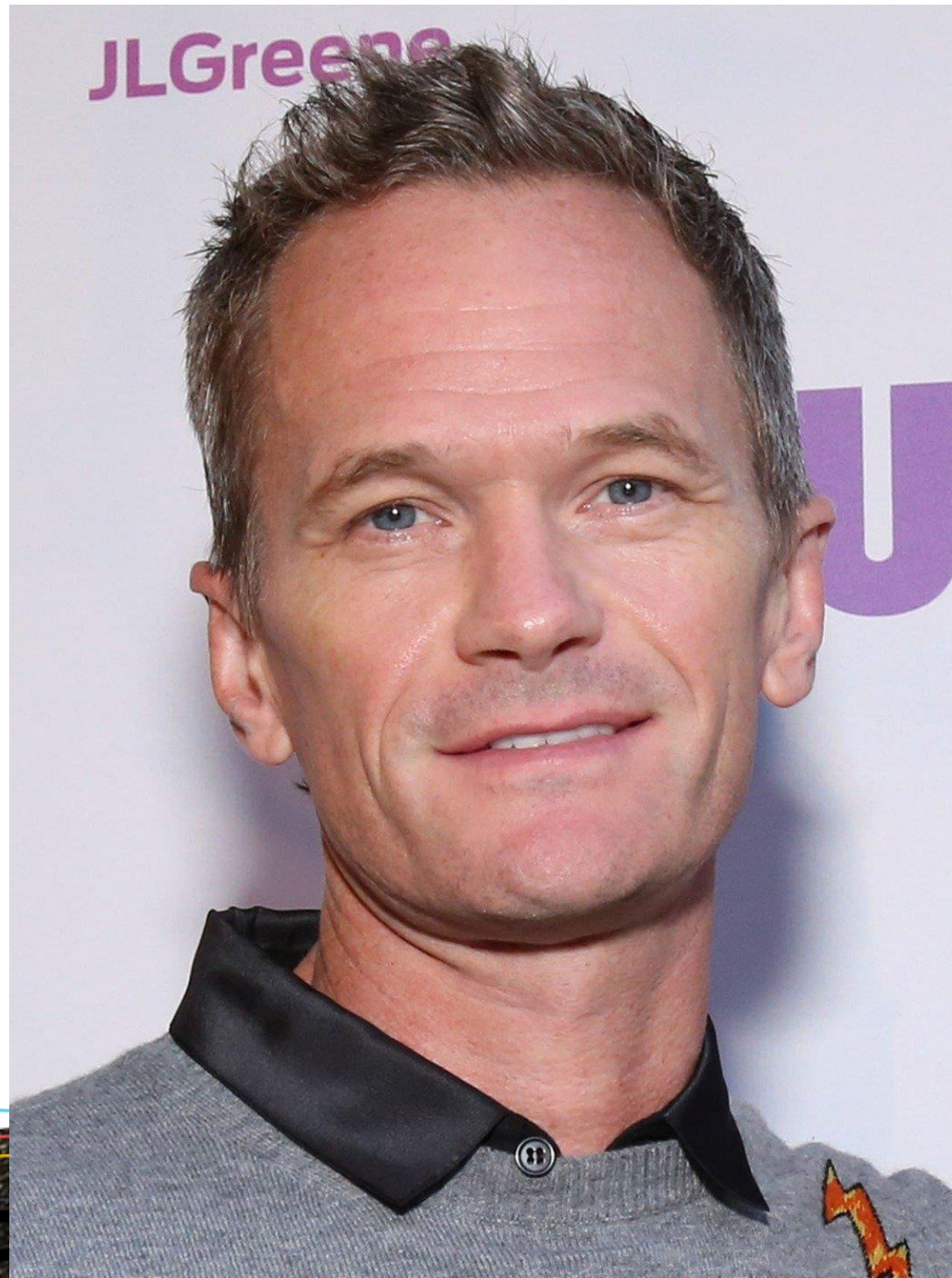
-ve

No further
investigation to
exclude PE

YES to All

Case 1

49-year-old male



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THE URGENT CARE CONVENTION

HIPP

Case 2

38-year-old female



HIPPO

Case 3

45-year-old male



HIP

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THE URGENT CARE CONVENTION

CENTOR



Group A streptococcus (GAS) rare under 3

3-14 years

+1

15-44 years

0

≥45 years

-1

Exudate or swelling on tonsils

No 0

Yes +1

Tender/swollen anterior cervical lymph nodes

No 0

Yes +1

Temp >38°C (100.4°F)

No 0

Yes +1

Cough

Cough present

0

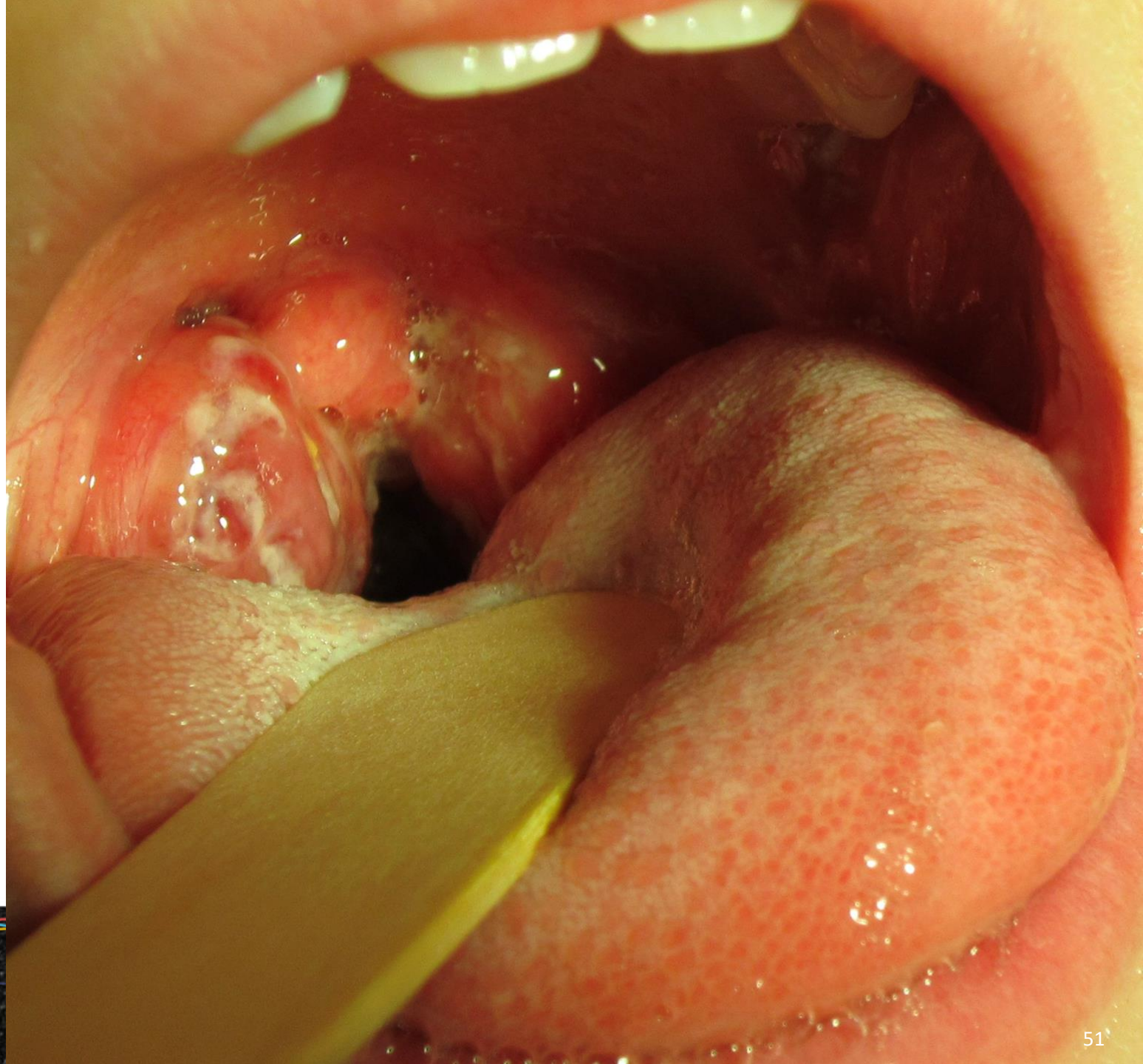
Cough absent

+1

CENTOR

Case 1

- 8 y/o male
- Pharyngitis x 2 days
- Fever 39C
- Tonsillar exudate
- + cervical lymph nodes
- NO cough



Age Group A streptococcus (GAS) rare under 3	3-14 years	+1
	15-44 years	0
	≥45 years	-1

Exudate or swelling on tonsils	No 0	Yes +1
--------------------------------	------	--------

Tender/swollen anterior cervical lymph nodes	No 0	Yes +1
--	------	--------

Temp >38°C (100.4°F)	No 0	Yes +1
----------------------	------	--------

Cough	Cough present	0
	Cough absent	+1

5

5 points

51% - 53% likelihood of strep

Consider rapid strep testing and/or culture. Empiric antibiotics may be appropriate depending on the specific scenario.

Would **YOU** treat this patient empirically for strep throat?

YES

NO

HIPPO



MONO

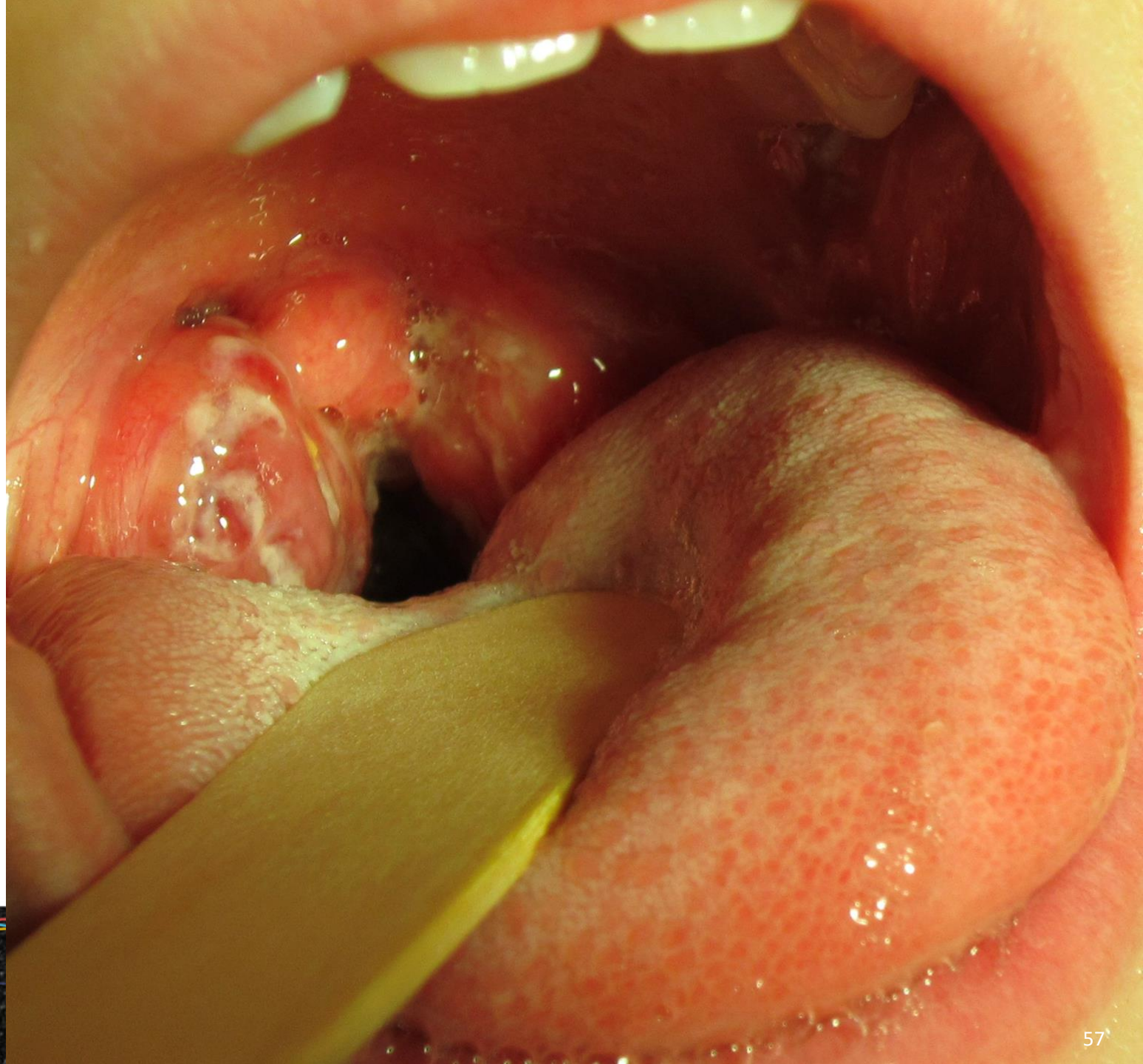


50 %

Centor Score	Action
0-1	NO testing needed
2+	Test and treat positives

Case 2

- 8 y/o male
- Pharyngitis x 2 days
- NO Fever
- NO exudate
- NO cough
- + cervical lymph nodes



3

Age Group A streptococcus (GAS) rare under 3	3-14 years	+1
	15-44 years	0
	≥45 years	-1
Exudate or swelling on tonsils	No 0	Yes +1
	No 0	Yes +1
Tender/swollen anterior cervical lymph nodes	No 0	Yes +1
	No 0	Yes +1
Temp >38°C (100.4°F)	No 0	Yes +1
	No 0	Yes +1
Cough	Cough present	0
	Cough absent	+1

3 points

28% - 35%

Consider rapid strep testing and/or culture.



Rapid Strep
NEGATIVE

Antibiotics



Steroids

Takeaways




- **Use the Centor Criteria as a compass not a roadmap**
- **Chronic carriers**
- **Alternative supportive treatments**

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NEXUS

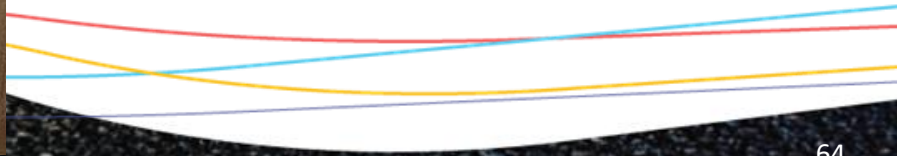
NEXUS Criteria for C-Spine Imaging

Clears patients from cervical spine fracture clinically, without imaging.

When to Use 	Pearls/Pitfalls 	Why Use 
Focal neurologic deficit present	<input checked="" type="checkbox"/> No 0	<input type="checkbox"/> Yes +1
Midline spinal tenderness present	<input checked="" type="checkbox"/> No 0	<input type="checkbox"/> Yes +1
Altered level of consciousness present	<input checked="" type="checkbox"/> No 0	<input type="checkbox"/> Yes +1
Intoxication present	<input checked="" type="checkbox"/> No 0	<input type="checkbox"/> Yes +1
Distracting injury present	<input checked="" type="checkbox"/> No 0	<input type="checkbox"/> Yes +1

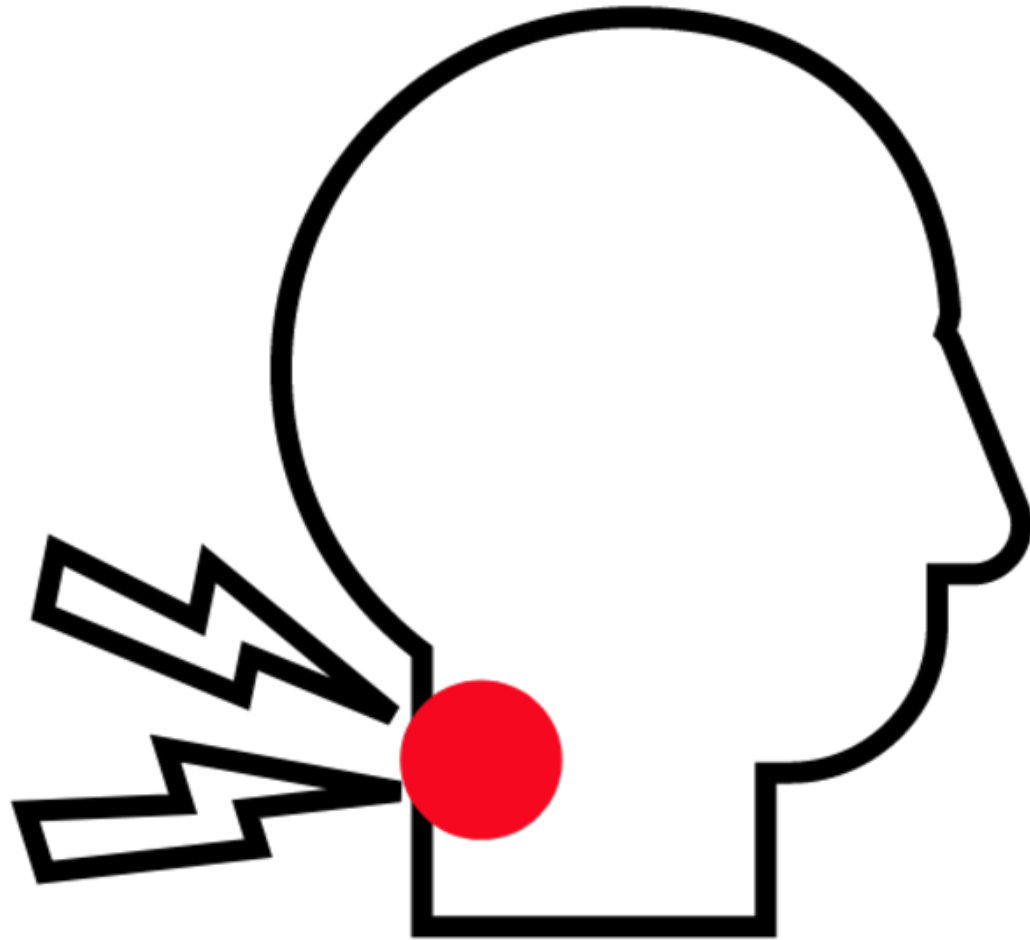


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THE URGENT CARE CONVENTION









HIPPO

Clinical Calculator Misuse/Abuse



**Are you currently documenting if
you use a clinical calculator?**

When you don't use a calculator or go against what the recommendation would have said...



Medical Axioms
@medicalaxioms



Replying to [@dinkjardine](#)

Anecdote is evidence until you and I survey 500 malpractice defense attorneys.

5:08 PM · Aug 1, 2017

**What happens when you follow a clinical
calculator and have a bad outcome?
Are scoring systems medicolegally
protective?**



Clinical Calculators: Friend or Foe?

How You Can Drive Change:

- This should simplify your practice, not make it harder
- Make sure you are using them appropriately
 - Right demographic, right situation
- Use these with patient/families
- Consider documenting them

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Session Evaluation

- Your feedback is valuable, take a moment to complete the survey for this session.
- To claim CME, you must complete a separate survey available after the convention.

* How likely are you to recommend this **content** to a colleague?

Not likely at all Neutral Extremely likely

0 1 2 3 4 5 6 7 8 9 10

What did you find most valuable about this **content**?

What would have made this **content** better?