Trauma Patients in the Primary Care Setting

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Disclosure

Consultant: EM:RAP

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Learning Objectives

1. Discuss approach to patients who present with injury due to trauma
2. Share "tricks of the trade" assessment skills
3. Discuss clinical decision tools to help decide who needs imaging or not

Case

- 45-year-old male
- Involved in a low speed MVC
  - MVC 4 hrs ago
- Walks into your office
- CC: Neck Pian
  - No neck pain at scene
  - Complains of mild neck pain now
- Exam: no c-spine TTP, can rotate neck to left & right

What Do You Do in This Case?

A. Send to ER for CT Scan of c-spine
B. Reassurance with conservative treatment
C. Order out-patient CT

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- Do you need to image his neck??
- What decision rules can you use to make this decision?

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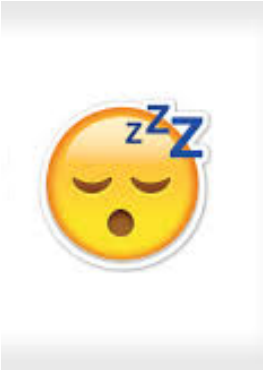
Decision Rules: You Say.....



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Decision Rules: I Say.....

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C-Spine Imaging

- Canadian C-Spine Rules
- NEXUS C-Spine Rules

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Canadian C-Spine Rules

- Guidelines used to decide if C-Spine Imaging is NOT needed
  - Adults with Blunt Trauma
  - GCS 15 and stable
  - 100% sensitivity for identifying "clinically important C-spine injuries"

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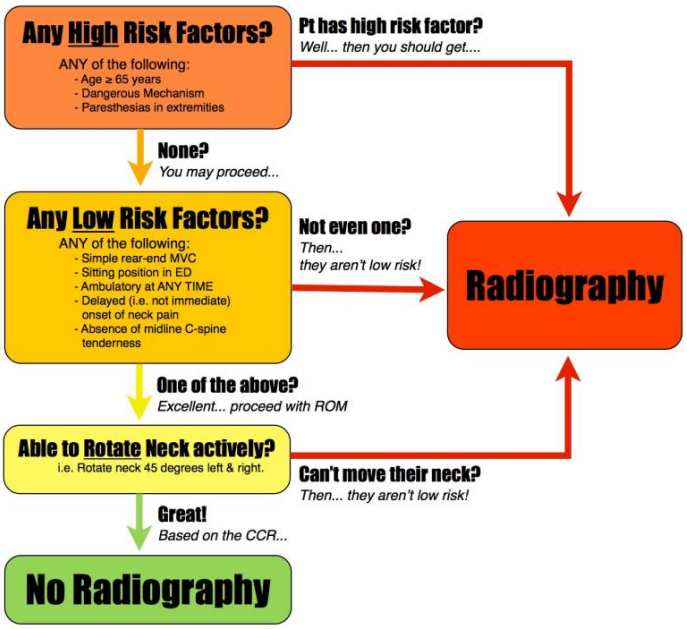

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Canadian C-Spine Rules

– ANY High-Risk Factors: ➡ GET CT
  - Age >65
  - Dangerous mechanism*
  - Paresthesia in extremities

- *Mechanism = fall >3ft, high speed mvc, rollover, ejection, axial load, bike collision

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Canadian C-Spine Rules

- Low Risk Factors
  - Simple rear end MVC
  - Delayed onset of pain
  - Sitting position in ED
  - Ambulatory at any time
  - Absence of midline TTP

- If all Low-Risk, then check ROM
  - Rotates neck 45 degrees to the left and right

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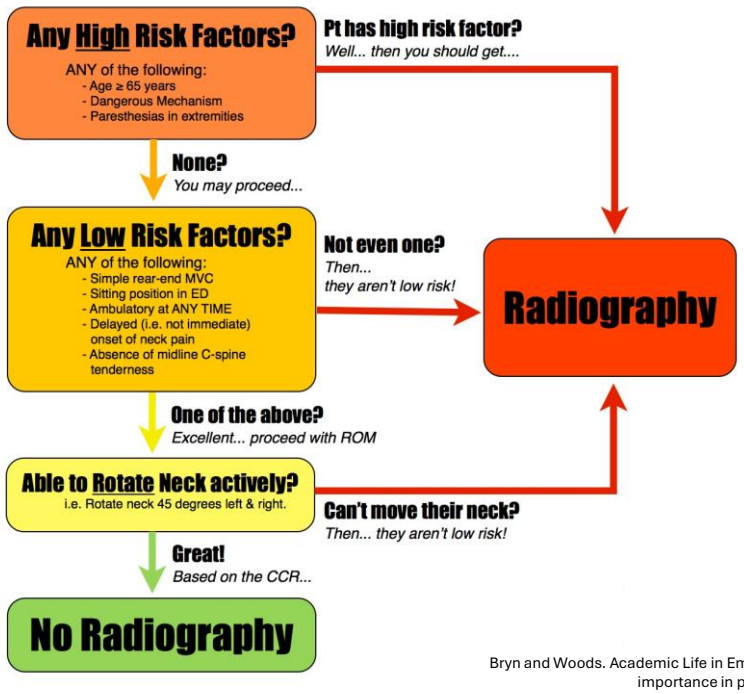

Bryn and Woods. Academic Life in Emergency Medicine, PECARN: Its relevance and importance in pediatric emergency care. Pediatrics, 1/7/2020.

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Canadian C-Spine Rules

- 100% sensitivity for identifying "clinically important C-spine injuries"

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NEXUS C-Spine

- Blunt trauma pts
- 99.6% sensitive for clinically important injury
- *not many elderly pts (> age 65) in the study so use caution when applying to elderly population

Paykin G, O'Reilly G, Ackland HM, Mitra B. The NEXUS criteria are insufficient to exclude cervical spine fractures in older blunt trauma patients. Injury. 48 (5): 1020-1024.

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NEXUS C-Spine

- Imaging NOT necessary if:
  - No focal neuro deficits
  - No midline cervical TTP
  - Normal alertness
  - No intoxication
  - No painful distracting injury

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Canadian Rules vs NEXUS

- Designed for whether or not a patient requires imaging
- Canadian
  - Reduced imaging rates by 44%
- NEXUS
  - Reduced imaging rates by 36%

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Canadian Rules vs NEXUS

Table 4. Sensitivity, Specificity, and Negative Predictive Value of the Two Rules for 162 Cases of "Clinically Important" Injury among 7438 Patients.*

Result of Assessment	Canadian C-Spine Rule		NEXUS Criteria	
	Injury	No Injury	Injury	No Injury
Positive (no.)	161	3995	147	4599
Negative (no.)	1	3281	15	2677
Sensitivity (%)	99.4 (95% CI, 96–100)†		90.7 (95% CI, 85–94)†	
Specificity (%)	45.1 (95% CI, 44–46)†		36.8 (95% CI, 36–38)†	
Negative predictive value (%)	100		99.4	

* A total of 845 cases were classified as indeterminate and are therefore omitted from this analysis.
† P<0.001. CI denotes confidence interval.

Stiell et al., 2003. Canadian C-Spine Rule vs NEXUS. *N Engl J Med*

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Back to the Case .....

- 45 -year-old. low speed MVC
- Not intoxicated and alert
- Ambulatory in ED
- No neck pain at scene, complains of mild neck pain now
- Exam: no c-spine TTP, can rotate neck to left & right

- Do you image??

Bryn and Woods. Academic Life in Emergency Medicine, PECARN: Its relevance and importance in pediatric emergency care. Pediatrics, 1/7/2020.

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Back to the Case .....

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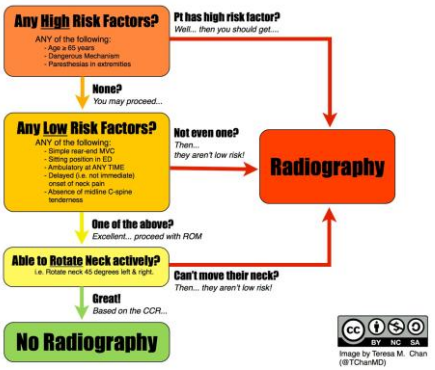
- Do you image??



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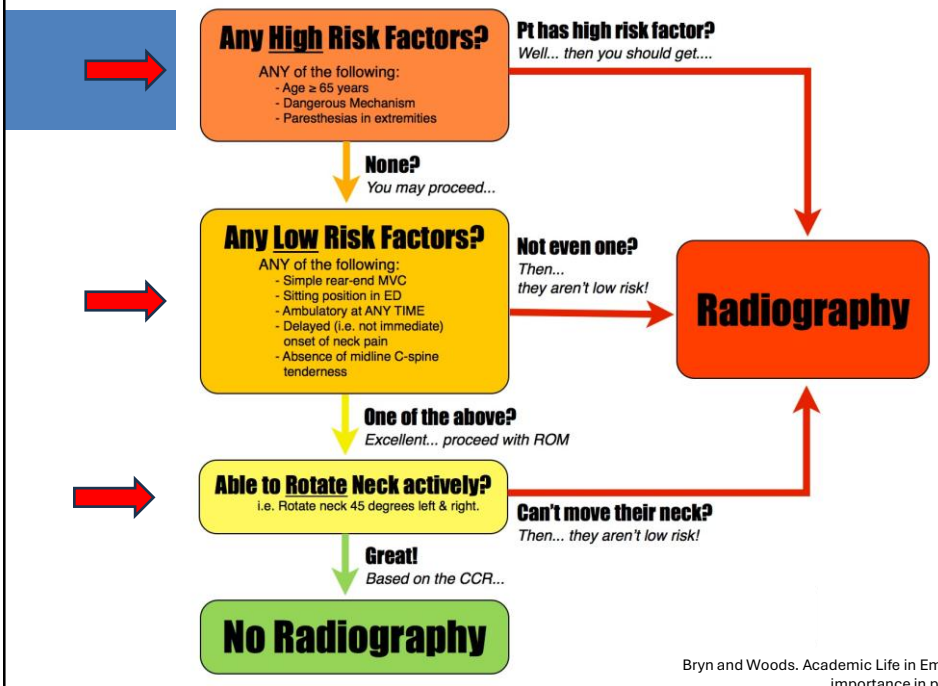

Bryn and Woods. Academic Life in Emergency Medicine, PECARN: Its relevance and importance in pediatric emergency care. Pediatrics, 1/7/2020.

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Case

- 30 -year-old. male presents after an MVC
- Hx of + LOC and + vomiting
- Not on blood thinners
- No sz, + HA
- Presents to the ED with vomiting

- DO YOU ORDER A HEAD CT??
- Any Decision Rules to help you make this decision?

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Who Needs a Head CT After Trauma??

- Canadian Head CT Rule
- New Orleans Rule
- PECARN for pediatrics

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Canadian Head CT Rule

- Validated rule to determine the need for head CTs
- Adult ED patients with MINOR head injuries

- Initial study was in 10 Canadian ED's
- 3121 patients
- Five high risk factors and two medium risk factors
  - Predict the need for subsequent NSS intervention

Stiell IG, Wells GA, Vandemheen K, Clement C, Lesiuk H, Laupacis A, McKnight RD, Verbeek R, Brison R, Cass D, Eisenhauer ME, Greenberg G, Worthington J. The Canadian CT Head Rule for patients with minor head injury. Lancet (London, England). 357 (9266): 1391-6.

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Canadian CT Head Rule for Minor TBI

CT Head only indicated if any one of the following present:

High Risk (for Neurological Intervention)

1. GCS score < 15 at 2 hrs after injury
2. Suspected open or depressed skull fracture
3. Any sign of basal skull fracture*
4. Vomiting ≥ 2 episodes
5. Age ≥ 65 years

Medium Risk (for Brain Injury on CT)

6. Amnesia before impact ≥ 30 min
7. Dangerous mechanism ** *(pedestrian, occupant ejected, fall from elevation)*

***Signs of Basal Skull Fracture**

- hemotympanum, 'racoon' eyes, CSF otorrhea/ rhinorrhea, Battle's sign

**** Dangerous Mechanism**

- pedestrian struck by vehicle
- occupant ejected from motor vehicle
- fall from elevation ≥ 3 feet or 5 stairs

Rule Not Applicable If:

- Non-trauma cases
- GCS < 13
- Age < 16 years
- Coumadin or bleeding disorder
- Obvious open skull fracture

Stiell IG, et al. The Canadian CT Head Rule for Patients with Minor Head Injury. Lancet 2001;357:1391-96.

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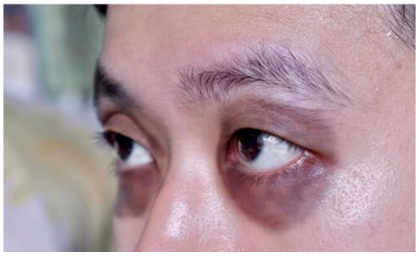
High Risk

High Risk (for Neurological Intervention)

1. GCS score < 15 at 2 hrs after injury
2. Suspected open or depressed skull fracture
3. Any sign of basal skull fracture*
4. Vomiting ≥ 2 episodes
5. Age ≥ 65 years



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Medium Risk

Medium Risk (for Brain Injury on CT)

6. Amnesia before impact ≥ 30 min
7. Dangerous mechanism ** *(pedestrian, occupant ejected, fall from elevation)*

Dangerous Mechanism:

- Ped vs auto
- Occupant Ejected from MVC
- Fall from >3 ft or 5 stairs

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Canadian Head CT Rule

- Can Not Apply Rule:
  - Blood thinner
  - Open skull fracture
  - Altered Mental Status (GCS < 13)

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Canadian Head CT

- CT not needed
  - If pt has none of the risk factors!
- If Positive Risk Factors -> Order Head CT
- Rule does NOT apply to Kids

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Canadian Head CT

- High-Risk Factors
  - 100% sensitive (95% CI 92-100%) for predicting need for neurological intervention
  - 32% of patients undergo CT
- Medium-Risk Factors
  - 98.4% sensitive (95% CI 96-99%) and 49.6% specific for predicting clinically important brain injury
  - 54% of patients to undergo CT

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New Orleans Rule

- Patients with
  - Head injury AND
  - Loss of Consciousness AND
  - Neurologically normal
- Sensitivity 97-100% for intracranial injuries needing NSS

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New Orleans Rule

- Questions (YES TO ANY = Need CT)
  - Headache
  - Vomiting
  - Age >60
  - Alcohol or drug intoxication
  - Persistent anterograde amnesia (short term memory deficits)
  - Visible trauma above the clavicles
  - Seizure

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Which Rule Is Best?

New Orleans Criteria

- ✓ Sensitivity and Specificity of detecting a clinically significant CT finding
- ✓ Sensitivity = 100%
- ✓ Specificity = 24.5 %
- ✓ Estimated to decrease CT imaging by **23%**

Canadian Head CT Rule

- ✓ Sensitivity and Specificity for need for neurosurgical intervention and clinically significant finding on CT imaging
- ✓ Sensitivity = 100%
- ✓ Specificity = 68%
- ✓ Proposed to reduce CT scanning **by 46%**

Rafique & Singleton. Outpatient risk stratification for TBI. *Biomarkers for TBI*, (Ch. 27). 2020.

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Back to the Case .....

- 30 -year-old male presents after an MVC
- Has hx of + LOC and + vomiting
- Not on blood thinners, and no sz
- Presents to the ED with one episode of vomiting

What Do You in This Case? Do You Image?

A. Send to ER for head CT
B. Reassure patient no CT needed
C. Unsure

What About Pediatric Head Trauma?

- 6 -year-old. in MVC
- Retrained in car seat
- Mom reports a brief LOC
- One episode of vomiting

- Do you order a head CT?
- Any decision rules to help you make this decision?

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PECARN

- Clinical rule aims to find kids at very low risk of clinically important TBI
- Validated pediatric algorithm
  - Predicts likelihood of TBI and who needs a CT

Holmes JF et al; Pediatric Emergency Care Applied Research Network (PECARN). Identification of children at very low risk of clinically-important brain injuries after head trauma: a prospective cohort study. Lancet. 2009 Oct

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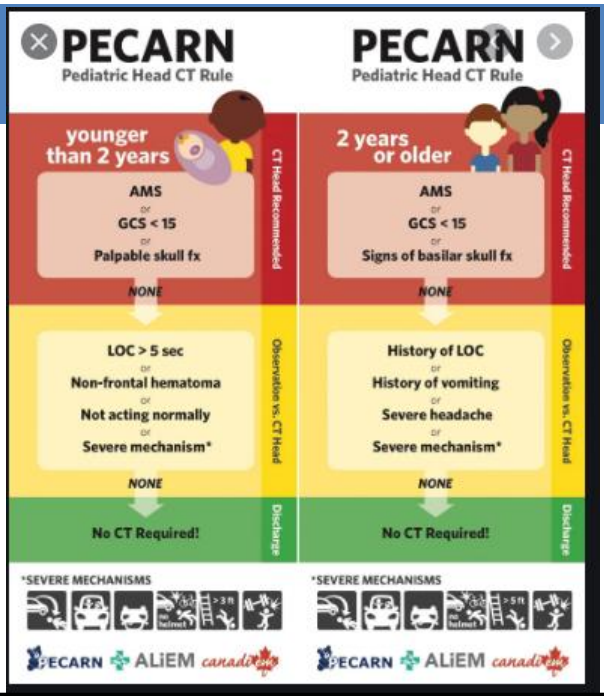
PECARN



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PECARN

- **Clinically important TBI** was defined as:
  - Death from traumatic brain injury
  - Neurosurgery
  - Intubation for >24 hours for traumatic brain injury
  - Hospital admission of ≥2 nights associated with traumatic brain injury on CT

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PECARN (Pediatric Emergency Care Applied Research Network)

- Largest trial of its kind!
- Low rates of TBI on head CT (5.2%)
- Even lower rates of clinically significant TBI (0.9%)

- Overall TBI in children is rare
- Head CTs decrease to 35% of pts (Avg 50%) if use PECARN Rule

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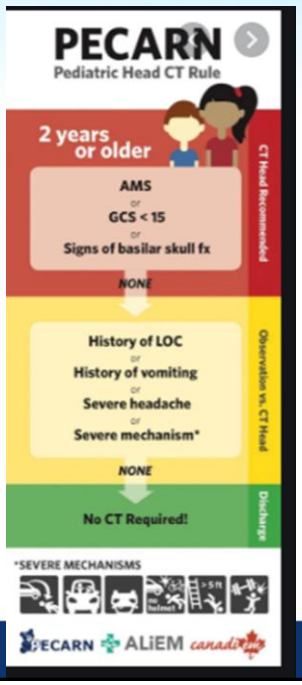
Back to the Case…

- 6 -year-old. in MVC, retrained in car seat
- Mom reports a brief LOC and 1 episode of vomiting

- Do you order the CT?



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Do You Order the CT?

A. Yes – order CT
B. No – discharge home
C. Yes, order CT or observation period

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Observation vs Head CT

Bryn and Woods. Academic Life in Emergency Medicine, PECARN: Its relevance and importance in pediatric emergency care. Pediatrics, 1/7/2020.

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Observation Period

- 4-6 hours from time of injury

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Case

- 15 -year-old playing golf
- Hit in forehead with golf ball 1 hr prior to arrival
- Mom most worried about the large goose-egg on forehead

Case Continued

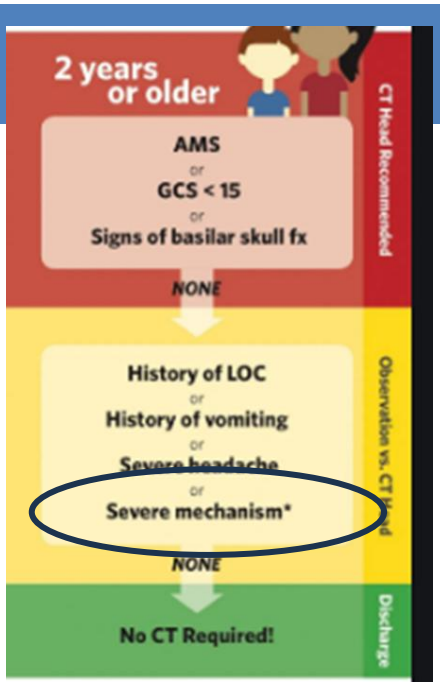
- Acting normal
- No LOC
- No n/v
- No blurry vision

What Is the Next Step?

A. Reassurance
B. Send to ER for CT head
C. Observe in Office for 2-4 hrs
D. Both (B) or (C)

PECARN

- Golf ball to head
  - No LOC
  - No n/v
  - Acting normal



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PECARN: Severe Mechanism

- MVC w/ ejection
- MVC w/ death of passenger or rollover
- Peds vs auto
- Bicycle vs auto
- Fall >6 ft
- Head strike by high impact object

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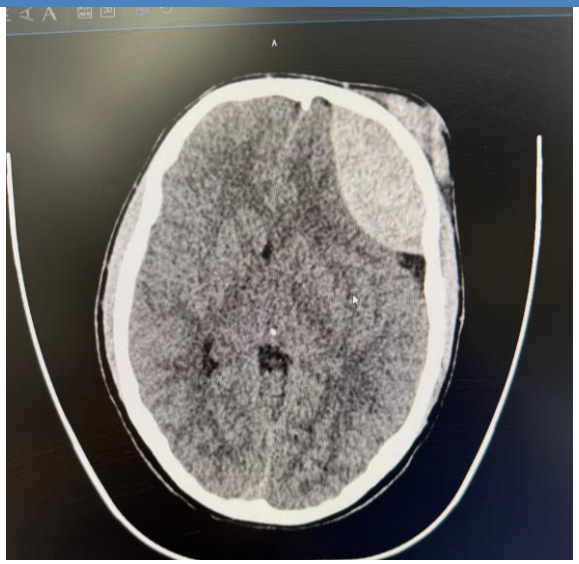
Case Continued

- In the next hour – lots of vomiting
- Sent to ED for Head CT



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Observation Period Works!

- Any AMS? (somnolence, irritability, repetitive)
- Vomiting?
- Worsening HA?
- Post traumatic seizure?

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Case

- 30 -year-old. presents to the ED s/p Fal
- Has right foot and ankle pain
- On exam full ROM and + TTP at base of 5th MT

- Do you get an X-Ray?
- Any Decision Rules to help you make this decision?

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Ottawa Rules

- Ottawa Ankle Rules
- Ottawa Foot Rules

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Ottawa Ankle and Foot Rules

- Rules published in 1992
- Reported 100% sensitivity
- Reduced the number of ankle x-rays by 36%

- A second trial in 1994 in JAMA
  - Much larger study
  - Replicated these findings

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How Accurate Is the Ottawa Foot/Ankle Rules?

- Meta-analysis of 27 studies
- 15,581 patients
- Negative likelihood ratios 0.08 (95% CI 0.03 to 0.18)
- Sensitivity almost 100%
- Accurate to rule out fracture and decrease x-ray use

Bachmann LM[1], Kolb E, Koller MT, Steurer J, ter Riet G. **Accuracy of Ottawa ankle rules to exclude fractures of the ankle and mid-foot: systematic review.** BMJ. 2003 Feb 22;326(7386):417.

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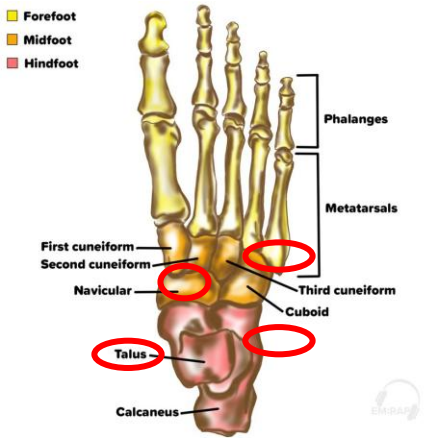
When To Get An X-Ray?

- Ottawa Foot Rules
  - Bony Tenderness of Navicular
  - Bony Tenderness of Base of 5th
  - Unable to bear weight immediately & in ED
- Ottawa Ankle Rules
  - Tenderness of LATERAL malleolus
  - Tenderness of MEDIAL malleolus
  - Unable to bear weight immediately & in ED



Ahlzadeh G. Ankle Fractures. In: Swadron S, Nordt S, and Mattu A, eds. CorePendium. 6th ed. Burbank, CA: CorePendium, LLC. https://www.emrap.org/corependium/chapter/rec3wzE1CS8TWt7S8/Ankle-Fractures. Updated September 6, 2024.

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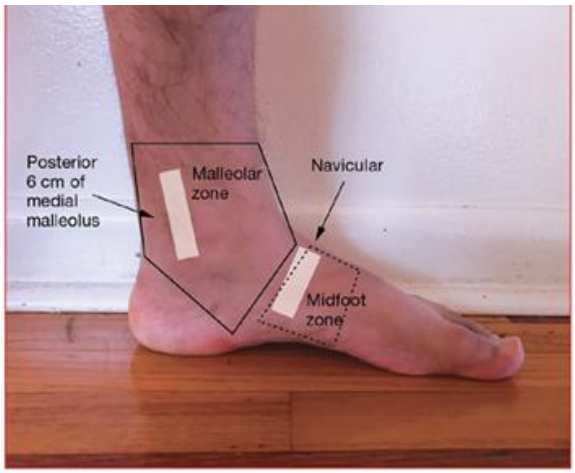
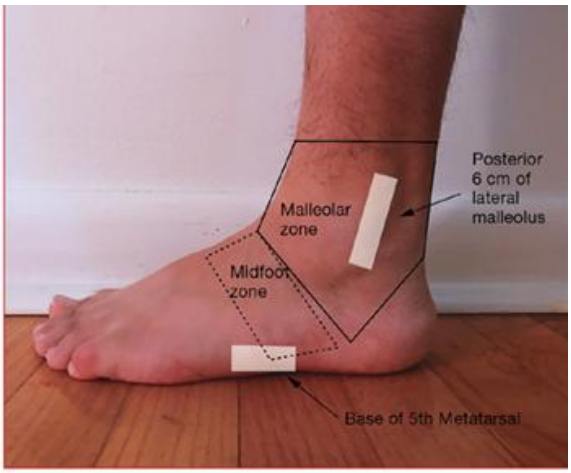
Ottawa Foot & Ankle Rules





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Can Ottawa Apply to Kids??

- The Ottawa ankle rules are validated in children
- Children need to be normally ambulating to apply the rule
- Be cautious in those <6 years old

Runyon MS. Can we safely apply the Ottawa Ankle Rules to children?. Acad Emerg Med. 2009;16 (4): 352-4. doi:10.1111/j.1553-2712.2009.00370.x

59

Back to the Case

- 30-year-old presents to the ED s/p Fall with ankle/foot pain
- Exam: TTP at base of 5th MT
- Do you get the x-ray?

Do You Get an X-ray?

A. Yes
B. No
C. Unsure

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YES –> X-Ray

- TTP at base of 5th MT
- What if patient 75 years old?
- Does age matter??

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What If It Was Knee Pain?

- Same case but complains of knee pain
- 30 -year-old. presents to the ED s/p Fall

- Do you image?
- Any decision rules to help you make this decision?

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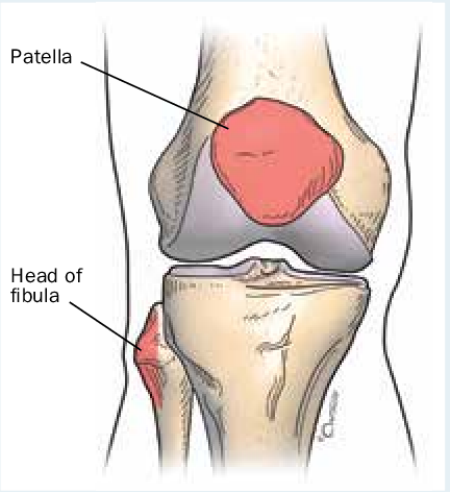
Ottawa Knee Rules

In patients with acute knee injury, a knee x-ray is necessary if any of the following criteria are met:

- Patient is aged 55 years or older
- Isolated tenderness of the patella (Figure 2)
- Tenderness at the head of the fibula (Figure 2)
- Inability to flex the knee to 90°
- Inability to bear weight both immediately and in the emergency department

Figure 2. Ottawa knee rules – regions of bone tenderness.

Adapted from Stiell et al., Ann Emerg Med 1995; 26: 405-413.[9]



Emparanza et al. (Ottawa Knee Rules). Ann Emerg Med, 2001; Stiell et al., JAMA, 1996.

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Ottawa Knee Validation

- *Annals of Int Med*, 2004
- Systematic review
- 6 studies, 4249 adult pts in the meta-analysis
- Pooled Sen 98.5%
- Pooled Spec 48.6%

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How Accurate Is the Ottawa Knee Rules?

- Meta-analysis of 6 studies
- 4249 adult patients
- Sensitivity was 98.5% (CI, 93.2% to 100%)
- Specificity was 48.6% (CI, 43.4% to 51.0%)

- A negative Ottawa knee rule test accurately excludes knee fractures after acute knee injury

- Bachmann LM[1], Haberzeth S, Steurer J, ter Riet G. **The accuracy of the Ottawa knee rule to rule out knee fractures: a systematic review.** Ann Intern Med. 2004 Jan 20;140(2):121-4.

66

Case

- 40 -year-old. female presents with left knee pain
- Stepped into a hole and twisted her knee yesterday
  - unable to walk now
- Exam: Effusion to left knee,

pain with passive & active ROM

- Does she need an x-ray? MRI?

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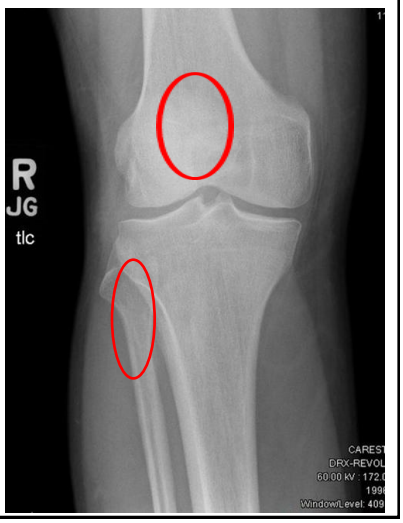
Ottawa Knee Rules

X-ray needed with 1 or more:

- Age 55 years or older
- Tenderness at head of fibula
- Isolated tenderness of patella
- Inability to flex knee > 90°
- Inability to bear weight both immediately and in ED (4 steps)



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Pittsburg Decision Rule

- Fall or blunt trauma mechanism
- Age less than 12 or greater than 50
- Inability to ambulate (unable to take 4 full weight bearing steps)

- If NONE are present: Fracture ruled out 100%

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Ottawa Knee vs. Pittsburg Rule

- *Am J Emerg Med*, 2013
  - 90 pts with knee injury, all got x-rays
  - Assessed by ER & surgical resident prior to x-rays
  - All pts had 2 week follow up
- Sensitivity for fracture
  - 90% Ottawa vs 97% Pittsburg

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Does Ottawa Knee Rules Apply to Kids?

- *Ann Emerg Med,* 2003 **YES! (for age >5)**
- Prospective, multi-center study of 750 kids (age 2-16)
- Ottawa screen, physician discretion for x-rays
- Follow-up phone calls at 14 days by RN's
- Sen 100% & Spec 42.8%
- 31% less x-rays if Ottawa rules used

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Knee: Key Physical Exam

- Effusion
- Bony Tenderness
- Extensor Mechanism
- Stability
  - ACL/PCL
  - Collateral ligaments

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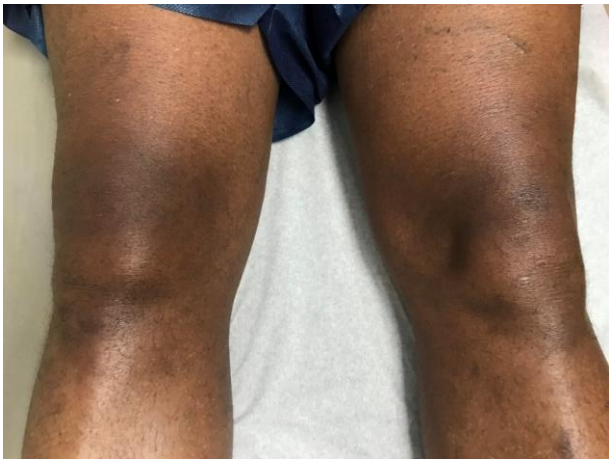
Effusion

- Fracture
- Dislocation
- Septic arthritis
- ACL/PCL injury



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Effusion

Fluid Displacement or Sweep Test

Ballottement or Patellar Tap Test

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Extensor Mechanism

- Patella fracture
- Patella/quadriceps tendon rupture

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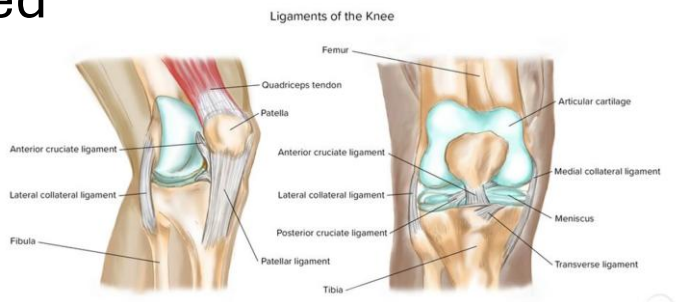
ACL/PCL

- Isolated vs Combined
  - Don't miss knee dislocation!
- Acute vs chronic
- Instability symptoms



Chooljian C. Knee Dislocations. In: Swadron S, Nordt S, and Mattu A, eds. CorePendium. 6th ed. Burbank, CA: CorePendium, LLC. https://www.emrap.org/corependium/chapter/rec3L19k1llWmlJsl/Knee-Dislocations. Updated September 11, 2024

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Tests for ACL Integrity

Anterior Drawer: Sens 0.73, Spec 0.93

Lachman: Sens 0.85, Spec 0.94

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Tests for ACL Integrity

Drop Leg Lachman

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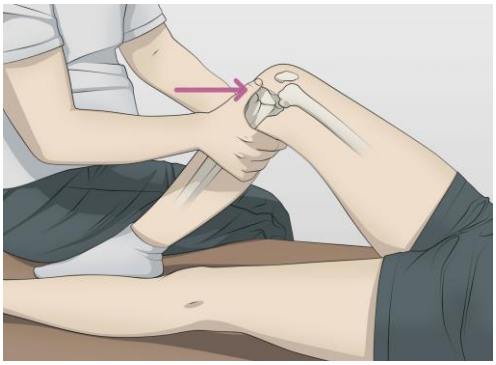
Tests for PCL Integrity



Posterior Drawer

Posterior Sag Sign

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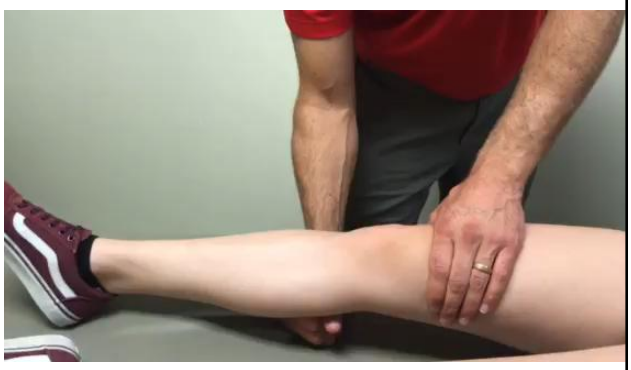
PCL Test: Lever Sign / Lelli Test



Sens & Spec ~ 1.00

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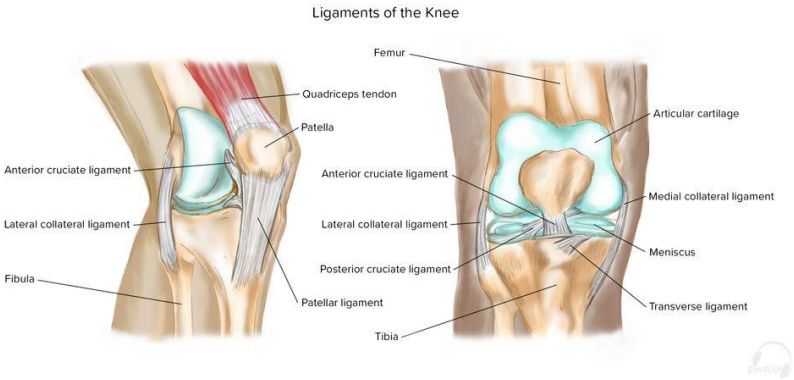
Collateral Ligaments

- Usually not emergent
- Conservative management



Chooljian C. Knee Dislocations. In: Swadron S, Nordt S, and Mattu A, eds. CorePendium. 6th ed. Burbank, CA: CorePendium, LLC. https://www.emrap.org/corependium/chapter/rec3L19k1llWmUsl/Knee-Dislocations. Updated September 11, 2024

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Medial Collateral Ligament

Valgus stress at 0 degrees

Valgus stress at 30 degrees

82

Lateral Collateral Ligament

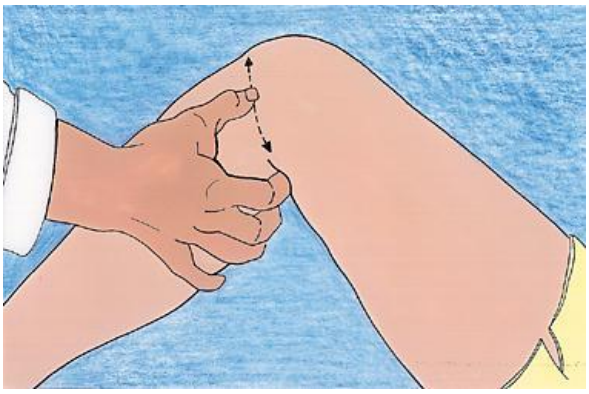
Varus stress at 0 degrees

Varus stress at 30 degrees

83

Meniscal Injury Physical Exam

- Joint Line Palpation
  - Supine
  - Knee flexed
- Palpation of medial & lateral joint lines



Friedman E. Ligamentous Injuries of the Knee. In: Swadron S, Nordt S, and Mattu A, eds. CorePendium. 6th ed. Burbank, CA: CorePendium, LLC. https://www.emrap.org/corependium/chapter/recxBlk7CeDb8TESV/Ligamentous-Injuries-of-the-Knee. Updated April 25, 2024.

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Back to the Case

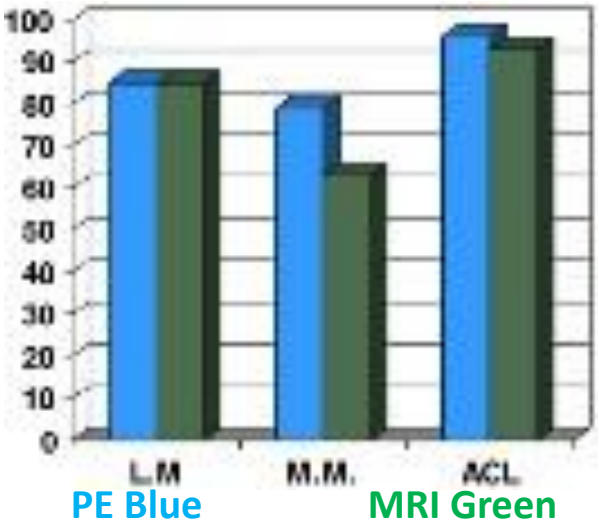
- 40-year-old female with ACUTE left knee pain
- Exam: Effusion to left knee, Patella tenderness on palpation
- Pain with passive & active ROM
- X-ray normal
- Still has pain
- What next in the workup?

Do You Order An MRI??

A. Yes
B. No

Delayed PE of the Knee Better Than MRI!

- *Int Ortho*, 2009
- Prospective
- 131 pts
- PE, MRI & arthroscopy
- PE superior to MRI for meniscus and ACL injury!



Int Orthop. 2009 Feb;33(1):129-32. doi: 10.1007/s00264-008-0520-4. Epub 2008 Feb 23.
Clinical, MRI, and arthroscopic correlation in meniscal and anterior cruciate ligament injuries.
Rayan F[1], Bhonsle S, Shukla DD.

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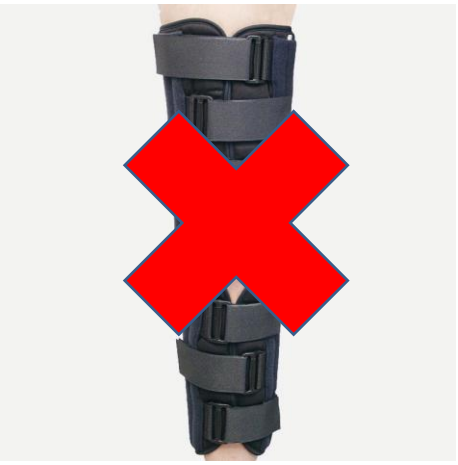
When to Use a Knee Immobilizer?



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If Patients Insists on Brace..

Hinged knee immobilizer

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Treatment for Acute Knee Pain

- Ice/Compression/Elevation
- Crutches (partial weight bearing as tolerated)
- Early ROM to prevent loss of mobility
- Trial of conservative measures first
- Follow up in 2 weeks for repeat exam
  - Still pain and laxity -> order MRI

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Case

- 67 -year-old presents 3 days after a fall
- Was in the ED and told had left sided rib fractures
- CC: Increase pain and SOB

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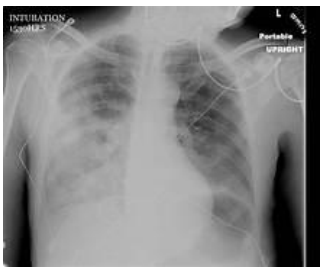
Rib Fractures & Mortality



- Study in Injury, 2012
- Rib fractures double risk of death if:
  - Advanced age (age >64)
  - Three or more rib fractures
  - Pre-existing cardiopulmonary dz-> CHF
  - 5x increased risk of death if develop PNA after chest trauma/rib fractures

Battle CE, Hutchings H, Evans PA. Risk factors that predict mortality in patients with blunt chest wall trauma: *Injury*. 2012;43(1):8-17.

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Physical Exam for Rib Fracture

- Check for Pulmonary complications:
  - Splinting
  - Short/shallow breath
  - Tachypnea
  - Hypoxia
- If Pulmonary complications present:
  - Refer to ED for admission

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Case

- 62 -year-old ground level fall 2 days ago
- Comes in with point tenderness and bruising over one rib
- Clear lungs
- Vitals normal
- O2 sat 100% after walking

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Do You Order an X-ray?

A. Yes: x-ray
B. No x-ray, just treat for rib fracture
C. Unsure

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Rib Fracture

- Clinical DX
  - PE and history
- Single isolated/low mechanism single rib fracture usually has benign clinical course
- No x-ray needed!
  - IF you suspect multiple rib fractures or underlying pulmonary damage -> get imaging

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Simple Isolated Rib Fracture Treatment

- Conservative therapy
  - Analgesia
  - Rest
  - Ice
  - Incentive spirometer

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NO RIB TAPING!

- Impedes respiratory effort
- Increases Pneumonia risk

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Case

- 30-year-old with back pain x 2 wks
- No fall, was playing pickle ball and noticed pain
- No midline TTP
- No bowel or bladder complaints

What Imaging Do You Order?

A. MRI L Spine
B. CT L-Spine
C. X-ray L Spine
D. None, conservative management

No Imaging Needed

- Study in Spine, 2000
- Withhold imaging for low back pain within the first 6 weeks of symptom onset
- Trial of conservative management
- UNLESS: Red Flags
  - Cancer, wt loss, immunosuppression, trauma, IVDU
  - Motor weakness, GU complaints, age>50

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Red Flags Mnemonic: TUNA FISH

- **T** TRAUMA
- **U** UNEXPLAINED WEIGHT LOSS
- **N** NEUROLOGIC SYMPTOMS
- **A** AGE >50
- **F** FEVER
- **I** INTRAVENOUS DRUG USE
- **S** STEROID USE
- **H** HISTORY OF CANCER

- If Red Flags – Order MRI!

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Pop Quiz

- 10-year-old brought in for vomiting by family
- Yesterday was jumping on trampoline and fell off striking head
- No LOC
- Witnessed by family
- Multiple episodes of vomiting
- No personality change

What do you do?

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What Do You Do?

A. Send to ED for head CT
B. Period of observation vs CT
C. Reassure family no CT needed
D. Unsure

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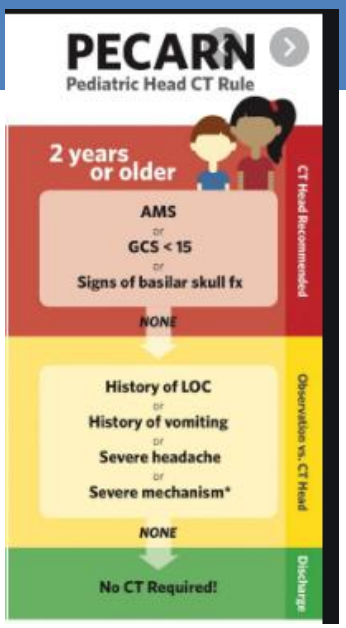
Observation vs CT

- Kid has been observed since yesterday and still vomiting
- They failed Observation and now need a Head CT!



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Pop Quiz

- 50-year-old was gardening and fell yesterday with brief episode of LOC
- No bruise or trauma on PE
- No vomiting
- No HA
- Alert and orientated
- Wants to get checked out

- Do you order a CT HEAD???

Do You Order CT Head?

A. Yes, order Head CT
B. No, no CT needed
C. Send straight to ER
D. Unsure

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Canadian & New Orleans Say NO CT Needed!!

Canadian Head Rule

Canadian CT Head Rule for Minor TBI

CT Head only indicated if any one of the following present:

High Risk (for Neurological Intervention)

1. GCS score < 15 at 2 hrs after injury
2. Suspected open or depressed skull fracture
3. Any sign of basal skull fracture*
4. Vomiting ≥ 2 episodes
5. Age ≥ 65 years

***Signs of Basal Skull Fracture**
- hemotympanum, 'racoon' eyes, CSF otorrhea/ rhinorrhea, Battle's sign

****Dangerous Mechanism**
- pedestrian struck by vehicle
- occupant ejected from motor vehicle
- fall from elevation ≥ 3 feet or 5 stairs

Medium Risk (for Brain Injury on CT)

6. Amnesia before impact ≥ 30 min
7. Dangerous mechanism ** *(pedestrian, occupant ejected, fall from elevation)*

Rule Not Applicable If:
- Non-trauma cases
- GCS < 13
- Age < 16 years
- Coumadin or bleeding disorder
- Obvious open skull fracture

Stiell IG, et al. The Canadian CT Head Rule for Patients with Minor Head Injury. Lancet 2001;357:1391-96.

New Orleans

- Questions (YES TO ANY = Need CT)
  - Headache
  - Vomiting
  - Age >60
  - Alcohol or drug intoxication
  - Persistent anterograde amnesia (short term memory deficits)
  - Visible trauma above the clavicles
  - Seizure

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Summary

Hard to follow clinical imaging rules when patients want imaging, but these are validated!

Think Canadian C-Spine Rule for neck pain post trauma

Think Canadian Head CT on your next minor head injury

Use PECARN in kids

Be very cautious with elderly rib fractures