Avoidable Imaging Initiative

Traumatic Brain Injury CT Prediction Rules in Children

Optimizing Uptake of Clinical Decision Support in the Electronic Health Record

Data Collection- CEDR and Quality/Performance Measures
Presenters

Nate Kuppermann, M.D., M.P.H.

Peter Dayan, M.D.

Arjun Venkatesh, M.D., MBA, MHS

Dustin Ballard, M.D., M.B.E.

David Vinson, M.D.
Traumatic Brain Injury CT Prediction Rules in Children:
Generating/Validating the Evidence, then Translating to Practice

Nathan Kuppermann, MD, MPH
Departments of Emergency Medicine and Pediatrics
University of California, Davis School of Medicine

Peter Dayan, MD, MSc
Division of Pediatric Emergency Medicine
Columbia University Medical Center
Morgan Stanley Children’s Hospital

E-QUAL Avoidable Imaging Webinar
November 17th, 2016
Disclosure

- No financial relationships or conflict of interests related to this talk
Objectives

- Briefly review the PECARN head trauma CT prediction rules derivation / validation
- Describe how PECARN is translating the TBI Prediction Rules into practice
The PECARN Head Injury Study

**Goal**: to derive a clinical decision rule to accurately identify children at near zero risk of clinically important traumatic brain injury after blunt trauma with high accuracy and wide generalizability
Outcome Definition

Clinically-important TBI (ciTBI)

- Death from TBI
- Neurosurgical procedure
- Intubation for $\geq 24$ hours for head injury
- Positive CT in association with hospitalization $\geq 2$ nights
The PECARN TBI Rules  
(derived and validated)

Children are at very low risk of clinically-important traumatic brain injury (TBI) if they meet all criteria in age-specific rule:

**Children < 2 years**
1. Severe mechanism of injury  
2. History of LOC $\geq$ 5 sec  
3. GCS = 14 or other signs of altered mental status  
4. Not acting normally per parent  
5. Palpable skull fracture  
6. Occipital/parietal/temporal scalp hematoma

**Children 2-18 years**
1. Severe mechanism of injury  
2. History of LOC  
3. GCS = 14 or other signs of altered mental status  
4. History of vomiting  
5. Severe headache in the ED  
6. Signs of basilar skull fracture
Recommendations for children younger than 2

The Rule

GCS=14 or other signs of altered mental status†, or palpable skull fracture

- Yes
  - 13.9% of population
  - 4.4% risk of ciTBI
  - CT recommended

- No
  - Occipital or parietal or temporal scalp haematoma, or history of LOC ≥5 s, or severe mechanism of injury‡, or not acting normally per parent

  - Yes
    - 32.9% of population
    - 0.9% risk of ciTBI
    - Observation versus CT on the basis of other clinical factors including:
      - Physician experience
      - Multiple versus isolated§ findings
      - Worsening symptoms or signs after emergency department observation
      - Age <3 months
      - Parental preference

  - No
    - 53.2% of population
    - <0.02% risk of ciTBI
    - CT not recommended¶
Recommendations for children younger than 2

A

GCS=14 or other signs of altered mental status†, or palpable skull fracture

Yes → CT recommended

13.9% of population
4.4% risk of ciTBI

No

Occipital or parietal or temporal scalp haematoma, or history of LOC ≥5 s, or severe mechanism of injury†, or not acting normally per parent

Yes → Observation versus CT on the basis of other clinical factors including:
  - Physician experience
  - Multiple versus isolated§ findings
  - Worsening symptoms or signs after emergency department observation
  - Age <3 months
  - Parental preference

53.2% of population
0.9% risk of ciTBI

No

CT not recommended¶
Recommendations for children 2 years and older

The Rule

GCS=14 or other signs of altered mental status; or signs of basilar skull fracture

- Yes: 14.0% of population, 4.3% risk of ciTBI, CT recommended
- No: 57.2% of population, <0.05% risk of ciTBI, CT not recommended

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

- Yes: 28.8% of population, 0.8% risk of ciTBI
- No: Observation versus CT on the basis of other clinical factors including:
  - Physician experience
  - Multiple versus isolated findings
  - Worsening symptoms or signs after emergency department observation
  - Parental preference
Recommendations for children 2 years and older

**B**

- **GCS=14 or other signs of altered mental status,** or **signs of basilar skull fracture**
  - **Yes**
    - 14.0% of population
    - 4.3% risk of cTBI
    - CT recommended
  - **No**
    - 57.2% of population
    - <0.05% risk of cTBI
    - CT not recommended

- **History of LOC, or history of vomiting, or severe mechanism of injury,** or **severe headache**
  - **Yes**
    - 28.8% of population
    - 0.8% risk of cTBI
    - Observation versus CT on the basis of other clinical factors including:
      - Physician experience
      - Multiple versus isolated findings
      - Worsening symptoms or signs after emergency department observation
      - Parental preference
  - **No**
    - Suggested
How to get clinicians to use the prediction rules?
Knowledge Translation Pipeline

Myth, opinion, poor research

2. Bedside Evidence-Based Practice
   - Aware
   - Accepted
   - Applicable
   - Able
   - Acted on
   - Agreed
   - Adhered to

4. Decision Aids, Patient Education, Compliance aids

3. Clinical Quality Improvement

1. Research Synthesis, Guidelines, Evidence Journals...

The research-to-practice pipeline. New research, of varying soundness, is added to the expanding pool and enters practice both directly or is reviewed, summarised, and systematised (delay) before entering practice, with leakage occurring at each of several stages between awareness and patient outcome. Different knowledge translation disciplines focus on different parts of the pipeline (1–4).

Glasziou and Haynes, 2005
Pediatric Head Trauma CT Decision Guide

Children 2 years and older

**GCS < 15**
- Signs of basilar skull fracture
- AMS (agitation, somnolence, slow response, repetitive questions)

**Vomiting**
- LOC
- Severe headache
- Severe mechanism of injury
  - Fall > 5 ft
  - MVA with ejection, rollover, or fatality
  - Bike/ped vs. vehicle w/o helmet
  - Struck by high-impact object

**Intermediate Risk – 0.8%**
- Observation vs. CT using shared decision-making

Clinical factors used to guide decision-making:
- Multiple vs. isolated factors
- Worsening findings during observation (AMS, headache, vomiting)
- Physician experience
- Parental preference

**High Risk – 4.3% risk of ci-TBI**
- CT
- Low Risk – < 0.05%
- Yes to any

**CT not indicated, Observe**

*ci-TBI: risk of clinically important TBI needing acute intervention, based on PECARN validated prediction rules

---

Pediatric Head Trauma CT Decision Guide

Children younger than 2 years

**GCS < 15**
- Scalp hematoma (excluding frontal)
- LOC > 5 seconds
- Not acting normally per parent
- Severe mechanism of injury
  - Fall > 3 ft
  - MVA with ejection, rollover, or fatality
  - Bike/ped vs. vehicle w/o helmet
  - Struck by high-impact object

**Intermediate Risk – 0.9%**
- Observation vs. CT using shared decision-making

Clinical factors used to guide decision-making:
- Multiple vs. isolated factors
- Worsening findings during observation (AMS, headache, vomiting)
- Physician experience
- Parental preference
- < 3 months old

**High Risk – 4.4% risk of ci-TBI**
- CT
- Low Risk – < 0.02%
- Yes to any

**CT not indicated, Observe**

*ci-TBI: risk of clinically important TBI needing acute intervention, based on PECARN validated prediction rules

Traumatic Brain Injury – Knowledge Translation Study Group; for the Pediatric Emergency Care Applied Research Network (PECARN), the Clinical Research on Emergency Services and Treatment (CREST) network, and Partners HealthCare System

This study was supported by the American Recovery and Reinvestment Act-Office of the Secretary (ARRA OS): Grant #S02MC19289-01-00. PECARN is supported by the Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB), Emergency Medical Services for Children (EMSC) Program through the following cooperative agreements: U03MC00001, U03MC00003, U03MC00006, U03MC00007, U03MC00008, U03MC22684, and U03MC22685
Aims

**Primary:** To determine whether implementing the PECARN TBI prediction rules using an intervention centered around computerized clinical decision support (CDS) decreases CTs in children with minor blunt head trauma at very low risk of ciTBIs

**Secondary:** To determine whether CDS that provides risk data for ciTBI for all children with minor blunt head trauma decreases CT use
Methods

Computer-Based Decision Support Development and Pilot

- Perform focus groups
- Perform ED work flow assessments
- Develop EHR blunt head injury template
- Develop CDS
- Pilot testing
### Methods

#### Patient assessment

**Blunt Head Trauma Assessment (skip any question if unable to determine answer)**

<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Yes - less than 24 hours ago</th>
<th>Yes - more than 24 hours ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blunt head trauma?</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Loss of consciousness?</td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td>Vomiting since injury?</td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
</tr>
</tbody>
</table>
### Blunt Head Trauma Assessment

**Blunt head trauma?**
- Yes - less than 24 hours ago
- Yes - more than 24 hours ago
- Yes - duration unclear

**Loss of consciousness?**
- Yes - less than 5 seconds
- Yes - 5 seconds up to one minute
- Yes - 1 minute or longer

**Vomiting since injury?**
- No
- Once
- Twice
- Three or more

**Acting normally per caregiver?**
- Yes
- No

**Severe mechanism of injury?**
- No
- Yes

**Current headache?**
- No
- Mild
- Moderate

**Other signs of altered mental status?**
- No
- Yes

**Temporal, parietal, or occipital scalp hematoma?**
- No
- Yes

#### GCS

<table>
<thead>
<tr>
<th>Eye Opening</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Response</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Motor Response</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total GCS**

**Other signs of altered mental status?**
- No
- Yes

**Row Information:**
- Other signs of altered mental status defined as any of the following:
  - Agitation
  - Somnolence
  - Repetitive questioning
  - Slow response to verbal communication

**Temporal, parietal, or occipital scalp hematoma?**
- No
- Yes
Methods

Clinical decision support

◆ Clinician received a statement no matter what was entered (*clear in focus groups*)

◆ Formatted similarly across statements
  • Recommendation
  • Risk estimate of clinically-important TBI
  • Management options (if relevant)
Traumatic Brain Injury Risk: Child less than 2 years

RECOMMENDATION: A head CT is not recommended for this patient based on the absence of any of the PECARN prediction rule variables.

Risk Estimate: The risk of clinically-important traumatic brain injury for patients less than 2 years is < 1/5000

Importantly, the PECARN rules were based on attending initial evaluations (not based on subsequent evaluations over time).

The age-specific PECARN rule findings documented are:

- Loss of consciousness?: No  10/05/12 1521 : THAM, ERIC
- Acting normally per caregiver?: Yes  10/05/12 1521 : THAM, ERIC
- Mechanism of injury?: Mild  10/05/12 1521 : THAM, ERIC
- Total Glasgow Coma Scale score: 15  10/05/12 1521 : THAM, ERIC
- Other signs of altered mental status?: No  10/05/12 1521 : THAM, ERIC
- Scalp hematoma?: None  10/05/12 1521 : THAM, ERIC
- Palpable skull fracture or unclear on the basis of swelling or distortion of the scalp?: No  10/05/12 1521 : THAM, ERIC

If the above clinical findings are incorrect, please revise.

Note: The PECARN prediction rules do not apply to patients with: bleeding diatheses, ventricular (e.g. “VP”) shunts, known brain tumors, or pre-existing neurological disorders complicating your clinical assessment.

Click here to view the PECARN prediction rule manuscript (Lancet)

Click to provide a revised risk assessment
Results

- Lower than expected baseline CT rates
  - Secular trends
- Modest, variable decreases in CT rates for patients at very-low risk and for all with minor head trauma
- No missed ciTBIs in patients at very-low risk
Conclusions

- Computerized CDS helps to safely decrease CT rates
- Provision of both recommendations and risk information helpful
  - Some clinicians want “directive” assistance
  - Others want risks for shared decision-making
- Unanticipated diffusion of information and secular trends likely decreased impact
- Novel methods for dissemination always needed
Optimizing Clinical Decision Support in the Electronic Health Record

Dustin W. Ballard & David R. Vinson

http://kpccrest.net
Background

- **Implementation science** is a new field of emphasis
- Historically, **knowledge translation** has taken a decade or longer to diffuse
- **Clinical decision support (CDS) through the EHR** holds promise
- **Adoption** of clinical decision support tools by clinicians is often limited by technical and workflow barriers
Physician Survey on Clinical Prediction Rules

- Are valuable tools for emergency physicians: 95%
- Are useful in discussing clinical decision-making with patients: 92%
- Help me justify my clinical decisions: 90%
- Are intended to improve care: 90%
- Help decrease unnecessary utilization: 89%
- Help me make clinical decisions: 86%
- When used and documented correctly, provide medico-legal protection: 76%
- Are oversimplified (“cookbook”) medicine: 22%
- Are too difficult to use: 10%

% of respondents who strongly or somewhat agreed
RISTRA (Risk STRAtification)

Multiple Clinical Qs
- Adult chest pain
- Pediatric Abd Pain
- Atrial fibrillation
- Others…
Assisting site-of-care decision-making

• Background
  • Most ED pts with PE are hospitalized despite evidence
  • We need help identifying pts who are low risk
    • Pulmonary Embolism Severity Index (PESI)
    • 11 weighted variables
  • We used RISTRA to integrate an auto-populating electronic PESI into our clinical workflow
A Risk Stratification Tool

RISTRA

CREST NETWORK

A Risk Stratification Tool

KAISER PERMANENTE INNOVATION FUND FOR TECHNOLOGY
PULMONARY EMBOLISM SEVERITY INDEX (PESI)

Name: Last, First; MR#: XXXXXXXXXX

Age: 35

YES NO
Altered Mental Status: ○ ○
Male: ○ ○
Cancer: ○ ○
Heart Failure: ○ ○
Lung Disease: ○ ○

YES NO
Temperature <36° C: ○ ○
Respiratory Rate ≥ 30/min: ○ ○
Heart Rate ≥ 110/min: ○ ○
Systolic BP <100 mmHg: ○ ○
O2 Saturation <90%: ○ ○

DATA IMPORTED FROM HC. PLEASE CHECK, EDIT & REFRESH AS NEEDED.
Name: Last, First;  MR#: XXXXXXXXXX

<table>
<thead>
<tr>
<th>Point Sum</th>
<th>PESI Class</th>
<th>Approx 30 day Mortality</th>
<th>Site of initial care</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 64</td>
<td>I</td>
<td>&lt; 2%</td>
<td>Outpt management is often possible</td>
</tr>
<tr>
<td>65-85</td>
<td>II</td>
<td>&lt; 2%</td>
<td>Outpt management is often possible</td>
</tr>
<tr>
<td>86-105</td>
<td>III</td>
<td>~ 5%</td>
<td>Inpatient care is often indicated</td>
</tr>
<tr>
<td>106-125</td>
<td>IV</td>
<td>~ 10%</td>
<td>Inpatient care is often indicated</td>
</tr>
<tr>
<td>≥ 126</td>
<td>V</td>
<td>~ 20%</td>
<td>Inpatient care is often indicated</td>
</tr>
</tbody>
</table>
Two Concurrent Studies

• What Factors Increase Tool Use? (14 EDs)
  • 10 “active” EDs w/on-site champions = intervention
    • Tool access with serial education, iterative physician-specific audits, incentives for first 3 enrollments
  • 4 “passive” EDs w/ neither champion nor promotion
    • Tool access and only an initial education session

• Pragmatic Implementation Study (21 EDs)
  • 10 active EDs vs 11 non-active
  • **Compare rates** of home discharge and safety outcomes
Results of USE study (n=662)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Reference</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facility</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site</td>
<td>Active</td>
<td>31.1</td>
<td>11.7</td>
</tr>
<tr>
<td></td>
<td>Passive</td>
<td>83.0</td>
<td></td>
</tr>
<tr>
<td>Low ED Volume</td>
<td>Yes</td>
<td>1.7</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>Acuity 1 Patient</td>
<td>Yes</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td><strong>Provider</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Female</td>
<td>0.9</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>40+</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>&lt;40</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Clinical Load</td>
<td>5+</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>&lt;5</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td><strong>Patient</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PESI Class</td>
<td>I, II</td>
<td>1.7</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>III+</td>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

Compared to mean facility ED census

Lower PE Severity = more likely to activate

67% vs. 13%
RISTRA Impact

Safety outcomes were unchanged:

- 5d PE-related return visit rate (6.5%)
- 30d all-cause mortality (0.7%)
Conclusions

• Performing active on-site tool promotion significantly increased odds of e-CDS tool activation

• Active promotion of an eCDS tool with an auto-populating PESI increased home DC rates without increasing 5d return visits or 30d mortality
THANK YOU VERY MUCH
Clinical Emergency Data Registry (CEDR) Imaging Measures

November 17, 2016
Dr. Arjun Venkatesh MD, MBA, MHS
Disclosures

• Centers for Medicare and Medicaid Innovation: ACEP TCPI
• Contracted with Centers for Medicare and Medicaid Services to develop hospital outcome and efficiency measures
The project described was supported by Funding Opportunity Number CMS-1L1-15-002 from the U.S. Department of Health & Human Services, Centers for Medicare & Medicaid Services. The contents provided are solely the responsibility of the authors and do not necessarily represent the official views of HHS or any of its agencies.
Alphabet Soup

MACRA
The Law

- Medicare Access and CHIP Reauthorization Act

QPP Payment

- Quality Payment Program

MIPS Scoring

- Merit Based Incentive Payment System

CEDR Data
What is a QCDR?

- QCDRs such as CEDR are quality reporting registries for the CMS Merit-based Incentive Payment System (MIPS)
- QCDRs are an alternative to “claims based reporting”
- QCDRs include unique quality measures
- QCDRs are approved by supported by CMS to:
  - Move quality measure development to clinicians
  - Give “credit” for several MIPS scoring categories
What is CEDR?

• Developed by ACEP to support emergency clinician participation in MIPS

• First and only emergency medicine specialty registry at a national level

• Successfully reported for physicians in 13 EDs during its 2015 pilot

• Facilitate emergency care research through the identification of practice patterns, trends and outcomes in emergency care
# CEDR Participation

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Providers</strong></td>
<td>262</td>
<td>797</td>
</tr>
<tr>
<td><strong>Number of Patient Visits</strong></td>
<td>458,263</td>
<td>780,513*</td>
</tr>
<tr>
<td><strong>Number of ED Engaged</strong></td>
<td>13</td>
<td>36</td>
</tr>
<tr>
<td><strong>Number of EMR/EDIS</strong></td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td><strong>Performance Measures</strong></td>
<td>27</td>
<td>42</td>
</tr>
</tbody>
</table>

*In Progress – Anticipated 1.7 million patient visits
What is an eCQM

- eCQM = electronic clinical quality measure

- Uses structured EHR data to ensure clinically relevant quality measures

- Uses a standard language
  - Value Set Authority Center (VSAC)
  - Measure Authoring Tools

- Requires mapping between CEDR and your hospital-based EHR
# Mappable EHRs

<table>
<thead>
<tr>
<th>Mappable EHRs</th>
<th>EMR</th>
<th>NextGen</th>
<th>Open EMR</th>
<th>Practice Partners **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agility</td>
<td>EyeDoc EMR</td>
<td>Maxim Eyes SQL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI Med</td>
<td>EYEMD EMR</td>
<td>MD Office</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AllMeds</td>
<td>GE Centricity</td>
<td>MDSuite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allscripts*</td>
<td>GEMMS</td>
<td>Medflow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amazing Charts</td>
<td>Glow Stream</td>
<td>MedEvolue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Medical Software</td>
<td>gMed</td>
<td>Medflow</td>
<td>Prime Clinical System</td>
<td></td>
</tr>
<tr>
<td>Aprima</td>
<td>Greenway Intergy**</td>
<td>MEDHOST EDIS</td>
<td>Prognocis**</td>
<td></td>
</tr>
<tr>
<td>Cerner**</td>
<td>Greenway/Primesuite</td>
<td>Medics DocAssistant</td>
<td>Pulse EHR**</td>
<td></td>
</tr>
<tr>
<td>Chart Maker Clinical</td>
<td>HCIT</td>
<td>MedInformatix</td>
<td>Quickview EMR</td>
<td></td>
</tr>
<tr>
<td>ChartLogic**</td>
<td>IFAX**</td>
<td>Medisoft**</td>
<td>RheumDocs**</td>
<td></td>
</tr>
<tr>
<td>Chartmaker Medical Suite</td>
<td>iMediCARE (cloud based)</td>
<td>Meditech</td>
<td>SoapWare</td>
<td></td>
</tr>
<tr>
<td>Compulink</td>
<td>IMS</td>
<td>Medstreaming</td>
<td>SRS EHR</td>
<td></td>
</tr>
<tr>
<td>Custom EHR</td>
<td>Integrity</td>
<td>Merge Financials</td>
<td>SuiteMed IMS</td>
<td></td>
</tr>
<tr>
<td>Cybax EHR</td>
<td>Interigy / Sage</td>
<td>MicroMD</td>
<td>TMed EHR</td>
<td></td>
</tr>
<tr>
<td>DigiDMS</td>
<td>IO Practiceware</td>
<td>Misys (Allscripts)**</td>
<td>TSystem</td>
<td></td>
</tr>
<tr>
<td>eClinicalWorks*</td>
<td>Key Chart</td>
<td>MOSAIQ</td>
<td>UniCharts**</td>
<td></td>
</tr>
<tr>
<td>eMDs**</td>
<td>Lytec MD</td>
<td>MyVision Express</td>
<td>Varian - Aria</td>
<td></td>
</tr>
<tr>
<td>eMedRec</td>
<td>MacPractice MD</td>
<td>NeoMed</td>
<td>VersaForm**</td>
<td></td>
</tr>
<tr>
<td>EPIC**</td>
<td>Management Plus</td>
<td>Netconnect**</td>
<td>VersaSuite</td>
<td></td>
</tr>
<tr>
<td>Exam Writer</td>
<td>Mastermind EHR</td>
<td>NetTech</td>
<td>Vieta EMR</td>
<td></td>
</tr>
</tbody>
</table>
• Emergency Department Utilization of CT for Minor Blunt Head Trauma for Patients Aged 18 Years and Older

• Emergency Department Utilization of CT for Minor Blunt Head Trauma for Patients Aged 2 Through 17 Years

• Appropriate Emergency Department Utilization of CT for Pulmonary Embolism
**Head CT Adult**

Percentage of emergency department visits for patients aged 18 years and older who presented within 24 hours of a minor blunt head trauma with a Glasgow Coma Scale (GCS) score of 15 and who had a head CT for trauma ordered by an emergency care provider who have an indication for a head CT

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Emergency department visits for patients who have an indication for a head CT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Denominator</strong></td>
<td>All emergency department visits for patients aged 18 years and older who presented within 24 hours of a minor blunt head trauma with a Glasgow Coma Scale (GCS) score of 15 and who had a head CT for trauma ordered by an emergency care provider</td>
</tr>
</tbody>
</table>
| **Denominator Exclusions** | • Ventricular shunt  
• Brain tumor  
• Multisystem trauma  
• Pregnancy  
• Currently taking any of the following antiplatelet medications*:  
  • ASA/dipyridamole  
  • clopidogrel  
  • prasugrel  
  • ticlopidine  
  • ticagrelor  
  • Cilostazol |
## Indications

<table>
<thead>
<tr>
<th>Minor Trauma and..</th>
<th>LOC or amnesia and ....</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Severe headache</td>
<td>• Headache</td>
</tr>
<tr>
<td>• Vomiting</td>
<td>• Age 60 years and older, and less than 65 years</td>
</tr>
<tr>
<td>• Age 65 years and older</td>
<td>• Drug/alcohol intoxication</td>
</tr>
<tr>
<td>• Physical signs of a basilar skull fracture (signs include haemotympanum, “raccoon” eyes, cerebrospinal fluid leakage from the ear or nose, Battle’s sign)</td>
<td>• Short-term memory deficits</td>
</tr>
<tr>
<td>• Focal neurological deficit</td>
<td>• Evidence of trauma above the clavicles (physical location, any trauma to the head or neck [ie, laceration, abrasion, bruising, ecchymosis, hematoma, swelling, fracture])</td>
</tr>
<tr>
<td>• Coagulopathy</td>
<td>• Posttraumatic seizure</td>
</tr>
<tr>
<td>• Thrombocytopenia</td>
<td></td>
</tr>
<tr>
<td>• Currently taking any of the following anticoagulant medications*:</td>
<td></td>
</tr>
<tr>
<td>• apixaban, argatroban, bivalirudin, dabigatran, dalteparin, desirudin, enoxaparinm fondaparinux, heparin, lepirudin, low molecular weight heparin, rivaroxaban, tinzaparin, warfarin</td>
<td></td>
</tr>
<tr>
<td>• Dangerous mechanism</td>
<td></td>
</tr>
</tbody>
</table>
Percentage of emergency department visits for patients aged 2 through 17 years who presented within 24 hours of a minor blunt head trauma with a Glasgow Coma Scale (GCS) score of 15 and who had a head CT for trauma ordered by an emergency care provider who are classified as low risk according to the PECARN prediction rules for traumatic brain injury.

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Emergency department visits for patients who are classified as low risk according to the Pediatric Emergency Care Applied Research Network (PECARN) prediction rules for traumatic brain injury.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denominator</td>
<td>All emergency department visits for patients aged 2 through 17 years who presented within 24 hours of a minor blunt head trauma with a Glasgow Coma Scale (GCS) score of 15 and who had a head CT for trauma ordered by an emergency care provider.</td>
</tr>
</tbody>
</table>
| Denominator Exclusions | • Ventricular shunt  
• Brain tumor  
• Coagulopathy  
• Thrombocytopenia |
“Low risk”

- No signs of altered mental status (e.g., agitation, somnolence, repetitive questioning, slow response to verbal communication)
- No signs of basilar skull fracture (signs include hemotympanum, “raccoon” eyes, cerebrospinal fluid leakage from the ear or nose, Battle’s sign)
- No LOC
- No vomiting
- No severe mechanism (i.e., 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 5 feet; or head struck by a high-impact object)
- No severe headache
Percentage of emergency department visits during which patients aged 18 years and older had a CT pulmonary angiogram (CTPA) ordered by an emergency care provider, regardless of discharge disposition, with either moderate or high pre-test clinical probability for pulmonary embolism OR positive result or elevated D-dimer level.

<table>
<thead>
<tr>
<th>Numerator</th>
<th>Emergency department visits for patients with either:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderate or high pre-test clinical probability for pulmonary embolism*</td>
</tr>
<tr>
<td></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td>Positive result or elevated D-dimer level</td>
</tr>
<tr>
<td>Denominator</td>
<td>All emergency department visits during which patients aged 18 years and older had a CT pulmonary angiogram (CTPA) ordered by an emergency care provider, regardless of discharge disposition</td>
</tr>
<tr>
<td>Denominator Exclusions</td>
<td>Pregnancy</td>
</tr>
</tbody>
</table>
Metrics

- How will you get this clinical data?
- What if the data is missing?
- Why aren’t the measures risk adjusted?

CMS/MIPS

- Do I have to report these imaging measures?
- What about that HTN screening metric?
- Why not pick “easier” metrics?
• Avoidable CT imaging for adult emergency department patients with recurrent renal colic

• Avoiding imaging for adult emergency department patients with atraumatic back pain
Wave II Starts March 2017

- Simple utilization measures
- Require ED billing diagnosis and CT utilization data

CT Utilization
- Non contrast Head CT/100 ED trauma visits
- Chest CT with IV contrast/100 ED visits
- Non contrast Head CT/100 Syncope visits
- Non contrast Abdomen CT/100 flank pain visits
- Lumbar XR/CT/MRI/100 back pain visits

CT Yield
- Intracranial hemorrhages/Non-contrast Head CT
- Pulmonary Embolism/Chest CT with IV contrast
Avoidable Imaging Webinar:
Thursday, December 8
1:00pm-2:00pm EST

ACEP E-QUAL Network Resources and More
Information:
www.acep.org/equal

Contact Nalani Tarrant (Project Manager):
ntarrant@acep.org