Implementation of Pediatric Cervical Spine Clearance Guidelines at a Combined Trauma Center: 12 Month Impact

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Nothing to Disclose
Introduction

- Pediatric cervical spine injuries are far less common than adult cervical spine injuries.

- These injuries often differ from adult injuries.

- Despite differences, children are often subjected to the same traumatic work-up as adult patients.
Introduction

- Work-up for cervical spine (c-spine) injury often involves a CT scan in adults
- A c-spine CT exposes children to radiation
- There is a need to create separate c-spine clearance guidelines at trauma centers
Methods

- IRB approved, retrospective review of pediatric patients (age <15) performed 12 months prior to and 12 months after implementation of cervical spine clearance guidelines at our combined adult and pediatric Level I Institution

- Children were brought in as either DELTA (highest tier) or ECHO (second tier) trauma team alerts
Methods

- Data collected included patient’s age, ISS, presence of NEXUS criteria, imaging used for cervical spine clearance, and other CT scans obtained.

- Guidelines developed to emphasize use of NEXUS criteria and to minimize radiation exposure.
Nexus Criteria:
- Midline Tenderness
- Altered Consciousness
- Intoxication
- Distracting Injury
- Neurologic Deficit

- Range of Motion without Pain
  - Yes
  - Cervical Spine Cleared
    - No Pain
      - Normal
      - Continued Pain Neurologic Deficit Prolonged Intubation
        - Normal
        - MRI
          - Abnormal
  - No Pain
    - Re-examine
      - Normal
      - CT if (+) Fracture
        - Abnormal
          - Neurosurgery Consult
            - MRI
              - Abnormal
NEXUS Criteria
1) Midline Tenderness
2) Altered Consciousness
3) Intoxication
4) Distracting Injury
5) Neurologic Deficit

Range of Motion Without Pain

AP/Lateral Cervical Spine Film

Cervical Spine Cleared
AP/Lateral Cervical Spine Film

Normal:
- Re-examine
  - No Pain
    - Cervical Spine Cleared

Abnormal:
- CTC-spine
  - Abnormal
    - Neurosurgery Consultation
  - Normal
On Re-examination:
1) Continued Pain
2) Neurological Deficit
3) Prolonged Intubation

MRI Cervical Spine

- Normal: Cervical Spine Cleared
- Abnormal: Neurosurgery Consultation
## Results

### Patient Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Pre-guidelines</th>
<th>Post-guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>128</td>
<td>105</td>
</tr>
<tr>
<td>Age (mean)</td>
<td>6.5</td>
<td>6.6</td>
</tr>
<tr>
<td>ISS (mean)</td>
<td>7.4</td>
<td>5.7</td>
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</table>
Results - Neck CT Scans with and without NEXUS

Pre-Guidelines

Percentage of Patients who Received Neck CT

<table>
<thead>
<tr>
<th>NEXUS YES</th>
<th>NEXUS NO</th>
<th>N</th>
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<tbody>
<tr>
<td>46</td>
<td>9</td>
<td>55</td>
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Post-Guidelines

Percentage of Patients who Received Neck CT

<table>
<thead>
<tr>
<th>NEXUS YES</th>
<th>NEXUS NO</th>
<th>N</th>
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</thead>
<tbody>
<tr>
<td>24</td>
<td>6</td>
<td>30</td>
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</table>
Results - Neck CT Scans with all other scans

Pre-Guidelines

Patients Receiving Any Other CT scan

Post-Guidelines

Patients Receiving Any Other CT scan

VCU Health System

CHILDREN’S
HOSPITAL OF RICHMOND AT VCU
Results - Neck CT Scans with Head CT

Pre-Guidelines

Patients Receiving a CT Head

- Neck CT YES
- Neck CT NO

Post-Guidelines

Patients Receiving a CT Head

- CT Scan YES
- CT Scan NO
## Results

### Patients Who Received CTC-spine by ISS

<table>
<thead>
<tr>
<th>Guidelines</th>
<th>C-spine CT</th>
<th>Mean ISS</th>
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<tbody>
<tr>
<td>Pre-</td>
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<td>4.5</td>
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<tr>
<td></td>
<td>Yes</td>
<td>11.3</td>
</tr>
<tr>
<td>Post-</td>
<td>No</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>8.2</td>
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</tbody>
</table>
CT scans decreased by 23% ($p = .01$)

Imaging other than CT decreased by 13% ($p = .02$)
Results

CT scans with head CT decreased by 16% (p=0.09)

CT scans with any other CT decreased by 15% (p=0.08)
There were no missed cervical spine injuries
Conclusion

- Guideline implementation can have an immediate impact on decreasing pediatric cervical spine CT scan usage and should improve over time.

- The creation of separate guidelines for clearance of the cervical spine in a pediatric population could be utilized at other major combined trauma centers.

- Guidelines may have applicability in lower volume non-pediatric trauma centers as experience develops.
Questions?