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Picture Perfect - Pediatric CT Utilization in Trauma

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PICTURE PERFECT

Pediatric CT Utilization in Trauma

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HCA Healthcare | Clinical Services Group

Trauma Center
Grand Strand Health

Introduction

- Radiation exposure poses a greater risk to children.
  - Children have a greater life expectancy, extending the amount of time potential cancer has to develop.
  - The body and organ size is much smaller, yet receives a similar dose of radiation from diagnostics.
  - The risk for developing radiation-related cancer may be higher for children vs adults.
  - Radiation exposure is quite common in trauma.

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Background

- Following an ACS consultative visit for Level II Pediatric standards, a weakness was identified regarding over-utilization of computed tomography (CT) scans on pediatric trauma patients (defined as age <15).
- A multidisciplinary radiation reduction plan began.
- Cervical spine and thorax CT scans were primary targets.

Methods

Quality Meeting

- The radiology medical director and trauma liaison presented evidence in support of decreased CT utilization in the pediatric trauma population at the monthly trauma quality meeting, in conjunction with three pediatric case reviews of possible overutilization. The radiologist critiqued all three cases. Intense discussion sparked and the decision was made to perform this review at **every pediatric trauma quality meeting** (Radiation Roundup).

Pediatric Radiation Roundup

July

Grand Strand Health

DOS	Age	Trans In	ISS	Mechanism	Injuries/ Add'l Notes	CT Scans Performed
[redacted]		N	34	Pedestrian vs Auto	Severe multitrauma/ Peer reviewed	CT head x6, cspine, chest, abdpel, face, repeat CAP
[redacted]		N	5	Jetski vs Boat	Abrasion, contusions, concussion/ Suspect high speed	CT head, cspine
[redacted]		N	2	Jetski vs Boat	Abrasion, contusions, concussion/ Suspect high speed	CT head, cspine

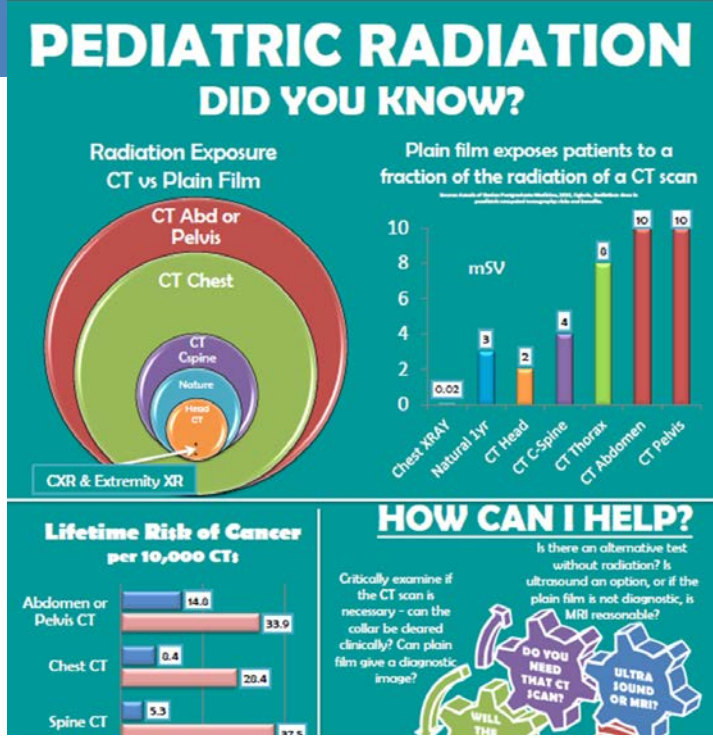
Methods

Operational changes

- CT c-spine and thorax were removed from the initial resus order form
- Pediatric emergency medicine physicians were incorporated into response to pediatric trauma alerts

Education changes

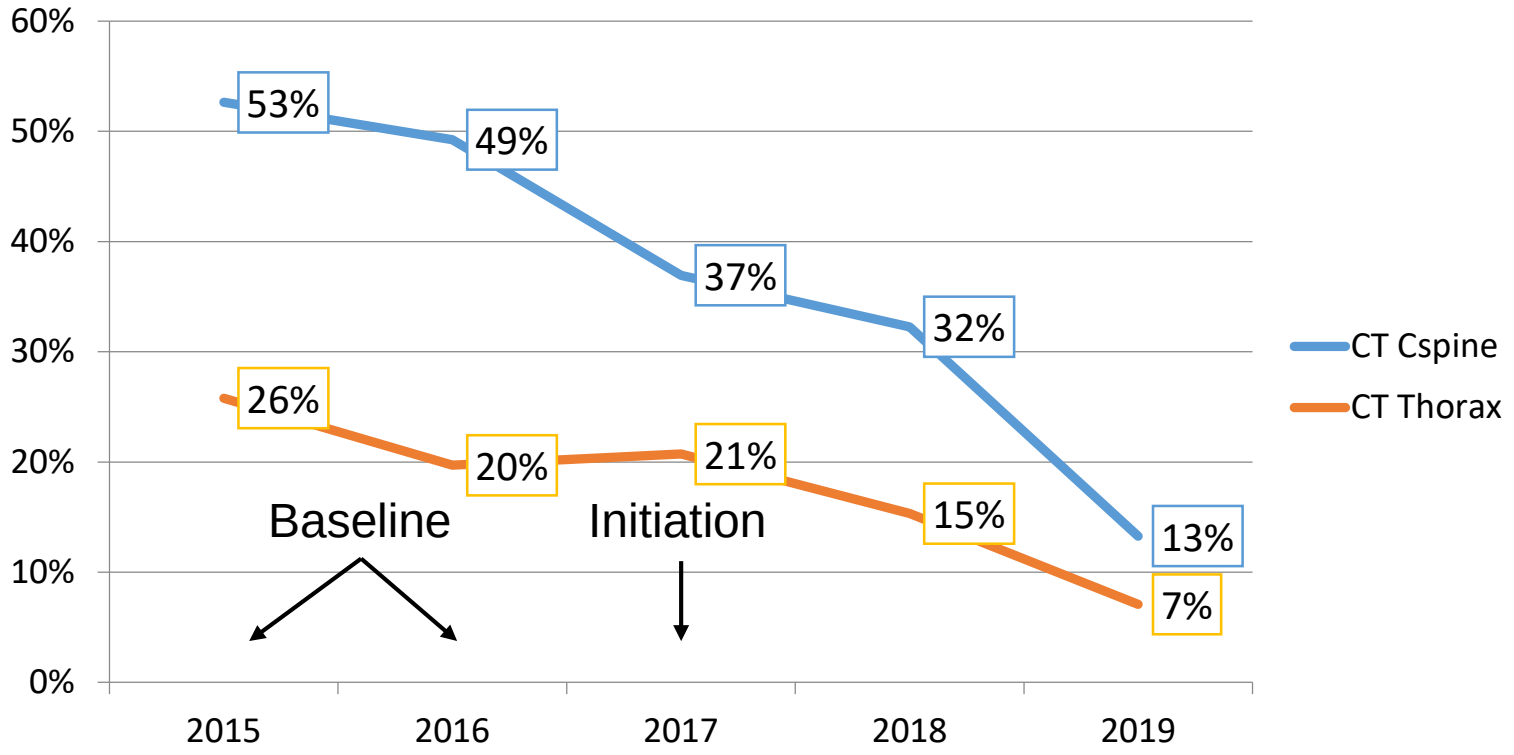
- Trauma and radiology created an educational flyer (right).
- Pediatric trauma imaging algorithms were hanged in every trauma bay which included radiation dose for each study
- A pediatric “departure to CT” checklist was created to include a pause for consideration of risk vs. benefits for diagnostic radiation



Study	Average Radiation Dose	Indications	Alternative or Adjunctive studies
CT Head	2 mSv or 100 CXRs	• AMS, GCS <15, LOC, not acting normally • Palpable skull fx or s/s basilar skull fx, non-frontal hematoma • Vomiting, severe headache, or severe mechanism	• Observation • MRI brain
CT Face	4 mSv or 200 CXRs	• Evidence of facial fracture on exam, severe pain or soft tissue swelling severe enough to limit exam • Flattening of the nasal dorsum • Limited extraocular motility or decreased visual acuity • Deformity, crepitus, step-off on facial bone palpation	• Plain film may be used to screen but not diagnostic • Isolated jaw: panoramic plain film
CT C-Spine	6 mSv or 300 CXRs	• Unable to clinically clear collar (NEXUS + flex/extension and rotate 45 degrees without pain) • Unreliable clinical exam • Abnormal neurologic exam	• AP/Lateral/Odontoid Xray • MRI C-spine
CT Thorax	7 mSv or 350 CXRs	• Suspected tracheobronchial injury • Suspected aortic injury (mechanism, exam or CXR findings) or great vessel injury • Abnormal respiration or lung sounds • Tenderness on chest wall palpation • Abnormal chest xray	• Chest xray • FAST • ECHO for BCI
CT Abd/ Pelvis	10 mSv or 500 CXRs	• Visible abdomen trauma or seatbelt sign, GCS <14, abd tenderness, thoracic wall trauma, c/o abd pain, decreased breath sounds, or vomiting • Beware of intoxication or painful distracting injury	• FAST • Formal abd ultrasound • Labs: LFTs, UA micro

Results

- Prior to implementation, the CT utilization rate ranged 49-53% for c-spine and 20-26% for thorax
- After two years, the CT utilization rate dropped 75% for c-spine and 73% for thorax



Results

- Further measurement involves comparison of injury severity score (ISS) before the initiative, and after.
- In 2017
  - The average ISS of a patient receiving a CT c-spine was 4.8.
- In 2019
  - The average ISS of a patient receiving a CT c-spine was 8.9
- Patients scanned now are more likely to be injured.

- **Zero missed injuries have been identified.**

Conclusion

- Pediatric radiation exposure is a critical element for trauma programs that treat children to routinely evaluate.
- A significant impact can be made in unnecessary CT scans with some education, operational changes and consistency in quality review.
- Programs should strongly consider reviewing this on a Regional Trauma Advisory Council level as well to decrease utilization within the whole trauma system.