

# Cervical Spine MRI Utilization for Identification of Cervical Spine Injuries Among Children With Non-Accidental Trauma

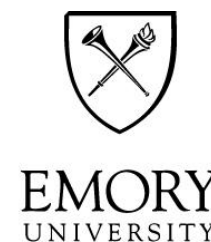
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**NO DISCLOSURES**



**Children's**<sup>SM</sup>  
Healthcare of Atlanta



**EMORY**  
UNIVERSITY

# Background: NAT & c-spine injuries


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- NAT is a significant cause of TBI and death in children
- Cervical spine injury has been associated with abusive TBI
- Incidence of cervical spine injuries in young children is low



# Background:

## Cervical Spine Guidelines with NAT

GUIDELINE FOR INPATIENTS WITH SUSPECT PHYSICAL ABUSE			
<b>Confirmed Intracranial Injury</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Abdominal labs</li> <li><input type="checkbox"/> (LFTs, pancreatic enzymes; U/A) (&lt;3 yo)</li> <li><input type="checkbox"/> DIC panel, Factor VIII, Factor IX, CBC/man diff; Type and Screen (consult hematology for further recommendations if indicated)</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Child protection team (CPT)</li> <li><input type="checkbox"/> Social work (includes DFCS/Law Enforcement referrals as appropriate)</li> <li><input type="checkbox"/> Trauma surgery</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> +/- special labs (ex, GA-Type II)</li> <li><input type="checkbox"/> Ophthalmology (&lt;6 mo or cranial imaging +, or other suspicion) (exam within 24 hours if clinically feasible)</li> <li><input type="checkbox"/> MRI brain/c-spine when clinically feasible (request "NAT protocol")<sup>^</sup></li> <li><input type="checkbox"/> +/- Platelet Function Assay</li> <li><input type="checkbox"/> Hematology consult if suspect underlying bleeding disorder</li> </ul>
<p>* MRI of the brain/c-spine should be performed as soon as clinically feasible after the initial head CT in patients with suspected or confirmed closed head injury. Optimally, the MRI should be performed immediately after the initial CT or within 48 hours of it. Scheduling should be performed in concert with the MRI department to determine earliest scanner availability. When ordering an MRI, consider also obtaining an MRV at the radiologist's discretion because venous thrombosis is often proposed in court as a possible cause of the intracranial findings. A recommendation for MRI c-spine to be included in the MRI brain protocol is being piloted for 6 months and the decision to keep/withdraw the recommendation will be made after that time.</p> <p><sup>^</sup> If the MRI is positive for injury, a follow up MRI should be considered for timing or prognostic information; discuss with radiologist</p>			

# Aims:

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- Determine trends of cMRI utilization and treatment and outcome related to c-spine injury in children with non-accidental trauma (NAT)
- Compare cMRI utilization before and after NAT guidelines were implemented



# Methods:

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**Institutional trauma registry**

**NAT**

**<9 years of age**

**503 patients  
(2009-2014)**

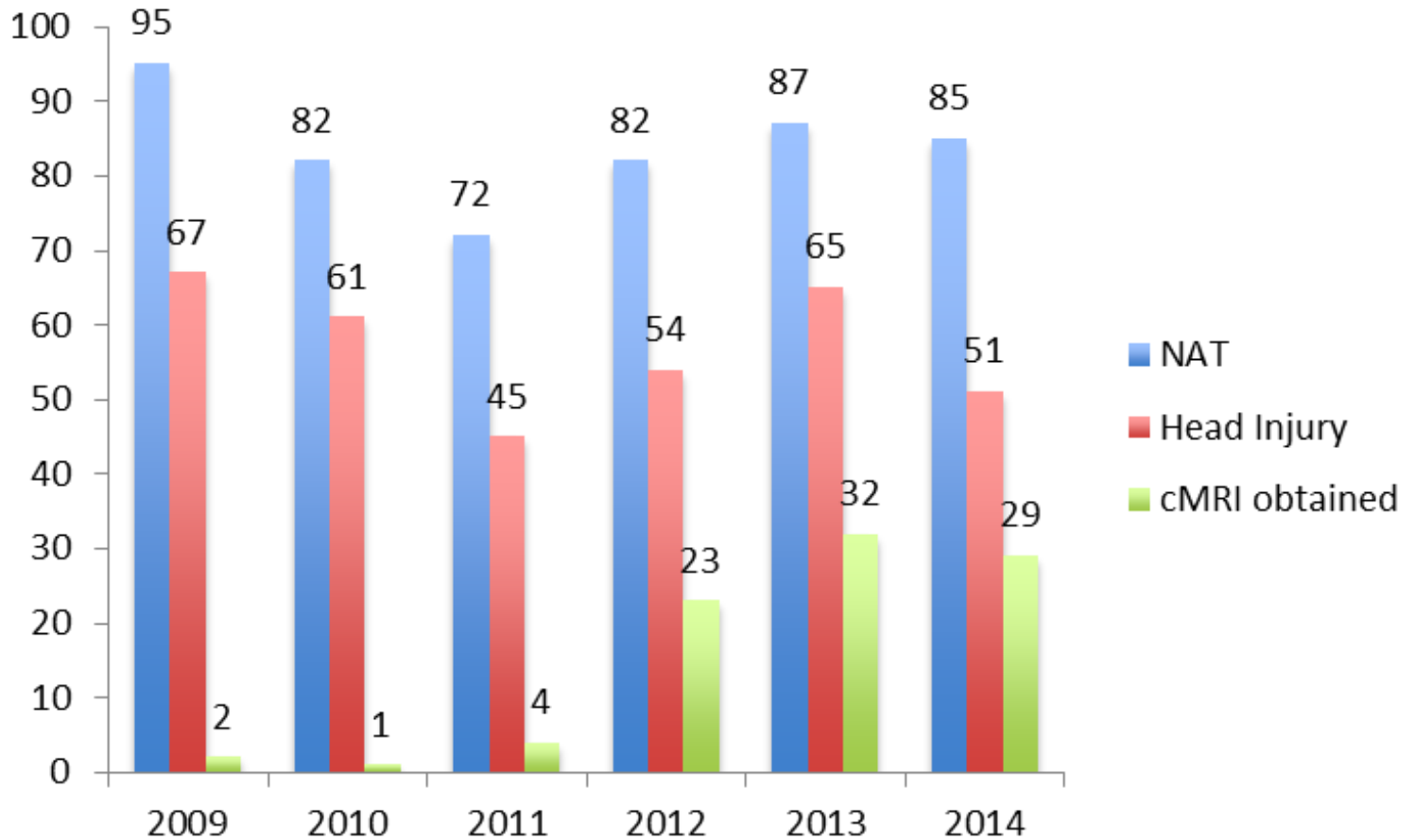
**PRE-  
N=249**

**POST-  
N=254**

**2009-2011**

**2012-2014**

# Results: cMRI Trends



# Results: Clinical Characteristics

## PRE- & POST-guidelines

	Pre-guideline (n=249)	Post-guideline (n=254)	P Value
Male	141 (56.6%)	144 (56.7%)	.99
ISS ≥ 16	109 (43.8%)	110 (43.3%)	.92
Head injury	173 (69.5%)	170 (66.9%)	.54
cMRI obtained	7 (2.8%)	84 (33.1%)	< .0001
Injury identified on cMRI	2 (0.8%)	26 (10.2%)	< .0001
C-collar applied at presentation	41 (16.5%)	70 (27.6%)	.003
Discharged with c-collar	0 (0.0%)	8 (3.2%)	.007
Deceased prior	11 (4.4%)	11 (4.3%)	.96
No. of craniotomy/craniectomy	13 (5.2%)	9 (3.5%)	.36
C-spine stabilization procedure	0 (0.0%)	1 (0.4%)	> .99
Fatality	32 (12.9%)	19 (7.5%)	.05



# Results: Clinical Characteristics

## Summary c-spine injuries

Case	Age (months)	C-spine injury	Associated Injuries	ISS
1	18	Ischemic injury within the central portion of the upper cervical cord	SAH	25
2	<1	C5/6 distraction injury	Clavicle fracture	29
3	2	Cervical cord edema	Skull fracture, SAH, SDH, EDH	25
4	29	Cervical cord edema	Skull fracture, intraparenchymal hematoma, SDH	25

# Summary:

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- Post-guideline group were much more likely to undergo cMRI (PRE- 2.8% vs. POST- 33.1% )
- Post-guidelines, there was a significant increase in cervical collar usage (PRE- 16.5 vs. POST- 27.6%) and more patients were discharged home with c-collar immobilization
- A single case of surgical stabilization was indicated in one patient in the post-guideline group
- Incidence of cranial injury and ISS were not significantly different between the PRE- & POST- guidelines.

# Limitations:

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- Lack of a clear guideline implementation date
- Retrospective
- Variations in physician decision-making in regarding to cMRI acquisition
- Rarity of clinically significant spine cord injury
- Clinical significance of ligamentous injury

# Conclusions:

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- Children are uniquely vulnerable to NAT, and their physiology predisposed them to a higher likelihood of cranial and cervical spine injury
- A heightened awareness of potential c-spine injury in this population increased the use of cMRI and soft-collar immobilization over a six-year period
- Severe c-spine injury remains rare and may not be readily impacted by increased use of cMRI.

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THANK YOU

