

Reviewing the recent literature to answer clinical questions: Should I change my practice?

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Objectives

- ▶ Review the literature to answer relevant clinical questions
- ▶ Discuss findings to determine whether data supports our practice
- ▶ Attempt to answer some questions such as: Does every patient with a complex febrile seizure need an LP

Case 1

- ▶ 3 yo female previously healthy, has one day of URI symptoms. Had a generalized tonic clonic seizure that lasted 2 minutes associated with a fever to 102. She was evaluated in the ED earlier today for this and discharged with diagnosis of simple febrile seizure. She returns 8 hours later for a second similar episode. She is currently well appearing, has a nonfocal neurologic exam and findings on exam c/w URI.
- ▶ Would you perform an LP on this patient?

Case 2

- ▶ 3 yo female transferred to your ED with h/o URI symptoms for one day, with a fever and h/o a seizure that started focally and then generalized and lasted for 20 minutes. Ativan was given. The patient was post ictal but upon transfer she is groggy but alert, has a nonfocal exam.
- ▶ Would you perform an LP on this patient?

Do all children who present with a complex febrile seizure need a lumbar puncture?

Annals of Emergency Medicine, 2017

- ▶ Goal: to assess the prevalence of bacterial meningitis and HSV meningoencephalitis in children presenting with complex febrile seizure and to determine the risk in a subgroup of patients for whom clinical examination does not suggest those infections.
- ▶ Multicenter retrospective study conducted in 7 pediatric emergency departments in the region of Paris, France

Do children need an LP following complex febrile seizure

- ▶ Febrile seizures occur in children 6 months – 5 years of age.
- ▶ Definition of simple febrile seizure
 - ▶ Single seizure
 - ▶ Duration less than 15 minutes
 - ▶ Generalized
- ▶ Definition of complex febrile seizure
 - ▶ Focal or
 - ▶ Prolonged or
 - ▶ Multiple seizures within 24 hours (>1)

Do children need an LP following complex febrile seizure

- ▶ Before Hib and S. pneumo vaccines, global prevalence of bacterial meningitis in children with seizure and fever was 0.8%
 - ▶ And about 5X higher in children with complex febrile seizure vs simple
- ▶ 2013 metaanalysis included some studies in the post vaccine era and found pooled prevalence of bacterial meningitis in children with complex febrile seizure of 0.6%

Do children need an LP following complex febrile seizure

- ▶ Out of 839 patients who presented with complex febrile seizures, 630 had no clinical signs suggesting meningitis or encephalitis
- ▶ Main outcome – bacterial meningitis or HSV meningoencephalitis
- ▶ Most frequent presenting feature of complex febrile seizure was **multiple episodes**
- ▶ From the 839 visits, clinical examination was suggestive of bacterial meningitis or encephalitis in 25%
- ▶ LP performed in 260 children (31%)

What do we want to know

- ▶ ... And what is the likelihood that we will find it in the spinal fluid?

Do children need an LP following complex febrile seizure

- ▶ Results
 - ▶ In the group that had clinical concern in addition to a complex febrile seizure, the bacterial meningitis proportion was 0.7%
 - ▶ All 5 patients presented with combined or isolated feature of prolonged seizure
 - ▶ No cases of HSV meningoencephalitis were detected
 - ▶ Among the 468 patients presenting only with multiple seizures in 24 hours, there were 0 cases of bacterial meningitis or HSV
 - ▶ Among the 630 visits in which clinical exam was not suggestive of either disease, no cases were found

Do children need an LP following complex febrile seizure

- ▶ Limitations
 - ▶ Retrospective – may have missed some patients
 - ▶ 15% not followed up at all (but were not present in the national database)
 - ▶ Relatively low incidence at baseline
 - ▶ Small size of focal and prolonged seizure groups
 - ▶ Study does not generalize to communities with inadequate immunization coverage

Do children need an LP following complex febrile seizure?

- ▶ Maybe not, if clinical exam is not suggestive of meningitis or encephalitis
 - ▶ The study wasn't powered to analyze results based on seizure features but the children with bacterial meningitis had prolonged seizures as at least 1 feature of the complex febrile seizure
 - ▶ However, in other studies, bacterial meningitis has been associated with febrile status epilepticus and prolonged seizures
- ▶ Authors concluded that guidelines should be developed limiting LP in this subgroup of children

Case follow up: To LP or not to LP?

- ▶ Case 1: 3 yo female previously healthy, has one day of URI symptoms. Had a generalized tonic clonic seizure that lasted 2 minutes associated with a fever to 102. She was evaluated in the ED earlier today for this and discharged with diagnosis of simple febrile seizure. She returns 8 hours later for a second similar episode. She is currently well appearing, has a nonfocal neurologic exam and findings on exam c/w URI.
- ▶ Case 2: 3 yo female transferred to your ED with h/o URI symptoms for one day, with a fever and h/o a seizure that started focally and then generalized and lasted for 20 minutes. Ativan was given. The patient was post ictal but upon transfer she is groggy but alert, has a nonfocal exam.

Case:

- ▶ 6 yo male with headaches 2x/week for last few months that are usually occipital. Not associated with early morning emesis, nighttime awakening or behavior changes. Does have a nonfocal neurologic exam. Does the occipital location raise a red flag?

Pediatric occipital headaches

- ▶ In general, occipital headaches have been considered to be suggestive of intracranial pathology. This is reinforced by the International Classification of Headache Disorders, 3rd edition
- ▶ Lifetime prevalence of pediatric headaches 54%

American Academy of Neurology Practice Parameter

- ▶ States that child with normal neurologic exam and recurrent headaches does not need neuroimaging
- ▶ Supports use of neuroimaging for children with:
 - ▶ Recurrent headaches and abnormal neurologic exam
 - ▶ History of recent onset severe headache
 - ▶ Recent change in the nature of the headache

Occipital Headaches and Neuroimaging in Children (Neurology, 2017)

- ▶ Retrospective review of cohort of pediatric patients seen in a neurology clinic for headache
- ▶ Reviewed patients over a 1 year period from 1-18 years of age
- ▶ 586 patients seen for headache, **356** included in the study
- ▶ 7% had an isolated occipital headache, 14% included occipital pain
- ▶ 308 had normal neurologic exam, of these 205 had neuroimaging
- ▶ More likely to have imaging if had occipital pain

Occipital Headaches and Neuroimaging in Children (Neurology, 2017)

- ▶ Neuroimaging results (CT or MRI or both)
 - ▶ Normal in 179 patients
 - ▶ Abnormal findings
 - ▶ Sinusitis (23)
 - ▶ Benign cyst (13)
 - ▶ Chiari 1 malformation (6)
 - ▶ Cerebellar ectopia (3)
 - ▶ Tumor (2) – pituitary mass and tectal glioma
 - ▶ Findings suggestive of pseudotumor (1)
 - ▶ Ventriculomegaly (1)

Occipital Headaches and Neuroimaging in Children (Neurology, 2017)

- ▶ Results
 - ▶ Occipital pain was not associated with intracranial pathology
 - ▶ In the 4 patients with serious intracranial pathology, none reported occipital pain
 - ▶ Neuroimaging can be deferred if decision solely based on the occipital location of the headache

Occipital Headaches and Neuroimaging in Children (Neurology, 2017)

- ▶ Limitations
 - ▶ This was a neurology clinic study, not done on ED patients so caution with generalizability
 - ▶ Children in the ED may present more acutely or with more severe h/a than seen in neurology clinic
 - ▶ However, in prior studies from the ED setting which suggested concern with occipital headache, other findings were present on exam
 - ▶ Retrospective

Occipital Headaches and Neuroimaging in Children

- ▶ Response to previous study by Dr. Christopher Oakley
 - ▶ The practice parameters from the American Academy of Neurology and the Child Neurology Society do not recognize occipital headaches as indicative of an intracranial process
 - ▶ The findings of the study we discuss support these practice parameters
 - ▶ Per Dr. Oakley, the 'key is the neurologic exam and history.'
 - ▶ Occipital location alone is not an indication for imaging

Case

- ▶ 4 yo female with sickle cell disease and fever. Fever x few hours. No cough or URI symptoms. Mild tachycardia with fever, otherwise nonfocal exam.
- ▶ In addition to CBC, reticulocyte count, blood culture and antibiotics per protocol, should you obtain a chest x-ray?

Which febrile children with sickle cell disease need a chest x-ray? (Academic Emergency Medicine, 2016)

- ▶ All children with sickle cell disease (SCD) who have a temperature greater than 38.5 ° C, should be evaluated with a cbc and blood culture and receive IV antibiotics
- ▶ One single-site study found that history and exam are not sensitive enough to determine which febrile children with SCD need a CXR
- ▶ Significant variation in practice due to conflicting recommendations in the literature
- ▶ Acute chest syndrome is the second leading cause of hospitalization in children with sickle cell disease
 - ▶ Accounts for up to 25% of premature death in this population

Which febrile children with sickle cell disease need a chest x-ray? (Academic Emergency Medicine, 2016)

- ▶ First multi-center study to help answer this question
- ▶ Retrospective chart review at 2 children's hospitals over 3 year period
- ▶ Including febrile children with SCD presenting to the ED
- ▶ Primary outcome was acute chest syndrome (ACS)
- ▶ Final sample included 1837 febrile ED visits made by 697 children with SCD

Which febrile children with sickle cell disease need a chest x-ray? (Academic Emergency Medicine, 2016)

- ▶ 10% met criteria for acute chest syndrome
- ▶ 94% of those patient visits had at least one respiratory sign or symptom
 - ▶ Most commonly cough, followed by tachypnea.
- ▶ Applying the current NHLBI recommendations (SOB, tachypnea, cough and/or rales) would have missed 27 cases of ACS
- ▶ Adding chest pain would detect 87.6% ACS
- ▶ Adding WBC >18.75 and history of ACS decreases risk of missed cases
- ▶ Using the model derived in this study, not all cases would be detected, 2.2% cases would be missed, an improvement from current guidelines

Which febrile children with sickle cell disease need a chest x-ray? (Academic Emergency Medicine, 2016)

- ▶ Question not fully answered – further study needed, ideally prospective, multicenter
- ▶ For those who already xray all febrile patients with SCD, probably won't change practice
- ▶ The study does indicate higher risk patients who should have a CXR

Which febrile children with sickle cell disease need a chest x-ray? (Academic Emergency Medicine, 2016)

- ▶ For patient in our case, if WBC less than 18.75, and no h/o acute chest syndrome, a reasonable approach is to defer chest xray
- ▶ For what it's worth, CHOP's protocol criteria for who gets CXR:
 - ▶ New hypoxia
 - ▶ Chest pain
 - ▶ Clinical suspicion for pneumonia/acute chest syndrome

Case:

- ▶ 4 mo female falls off a 3 foot table from her carseat. No LOC. Awake and alert on exam. Does have a right parietal hematoma. You have decided that the child needs imaging and are trying to limit radiation exposure. Is cranial US a good screen for intracranial hemorrhage in the patient with an open fontanelle?

The Utility of Cranial US for Detection of Intracranial Hemorrhage in Infants

(Pediatr Emerg Care, 2018)

- ▶ About 600,000 children present to the ED for head injury each year\
- ▶ Many patients require head imaging after risk assessment
- ▶ One of our goals is to minimize radiation exposure (ALARA)

The Utility of Cranial US for Detection of Intracranial Hemorrhage in Infants

(Pediatr Emerg Care, 2018)

- ▶ **Objective of the study:** determine the sensitivity and specificity of cranial ultrasound (CUS) in the evaluation of clinically significant intracranial hemorrhage as compared with the standard of CT, MRI or clinical outcome in infants with open fontanelle
- ▶ Retrospective analysis of patients less than 2 who had formal CUS during 5 year period 2008 - 2013
- ▶ Studies were ordered from the PICU, inpatient floor and rarely the ED
- ▶ For those patient who had an US but no other imaging, clinical outcome was defined as death, neurosurgery or neurological deficits thought secondary to an intracranial hemorrhage.

The Utility of Cranial US for Detection of Intracranial Hemorrhage in Infants

(Pediatr Emerg Care, 2018)

- ▶ Findings:
 - ▶ While CUS has great specificity for detecting ICH in infants (97-99%)
 - ▶ However, CUS has only moderate sensitivity in patients with significant ICH (78%) and poor sensitivity in those with insignificant ICH (33%)
 - ▶ Thus, poor screening test since many of the negatives are false negatives. (ie many bleeds would be missed if used as a screen)
- ▶ Conclusion: CUS is inadequate as a screen for ICH in infants with accidental trauma or inflicted injury

- ▶ 9 mo female fell from mother's arms. Acting normal, no vomiting or LOC. She has a scalp hematoma but an otherwise normal exam. CT scan reveals a linear, nondisplaced skull fracture without evidence of intracranial hemorrhage. Can this patient be discharged to home?

A Systematic Review and Meta-Analysis of the Management and Outcomes of Isolated Skull Fractures in Children (Annals of Emerg Med, 2017)

- ▶ In general, in the United States, most children with isolated skull fractures are admitted; is this necessary?
- ▶ Reasons for admission
 - ▶ Risk of clinical decompensation and evolving hemorrhage must be considered in the disposition
 - ▶ Evaluation for nonaccidental trauma
 - ▶ Treatment for persistent head injury symptoms, eg., vomiting, altered MS

A systematic Review and Meta-Analysis of the Management and Outcomes of Isolated Skull Fractures in Children (Annals of Emerg Med, 2017)

- ▶ Goal:
 - ▶ Determine proportion of children with isolated skull fracture who experience an acute decompensation requiring neurosurgical intervention or resulting in death
 - ▶ Inform clinical practice guidelines that can be used for children with an isolated skull fracture (excluded basilar or depressed skull fractures)
- ▶ 21 studies met final inclusion criteria

A systematic Review and Meta-Analysis of the Management and Outcomes of Isolated Skull Fractures in Children

(Annals of Emerg Med, 2017)

► Findings:

- None of the 6646 children with isolated skull fracture died
- 1/6646 required emergency neurosurgical intervention
- Of the 6280 from 16 studies with known ED disposition, 4,914 were hospitalized, with a weighted average hospitalization rate 83%
- Of the patients reimaged, 6 had a new intracranial hemorrhage, none of the 6 required neurosurgical intervention

A systematic Review and Meta-Analysis of the Management and Outcomes of Isolated Skull Fractures in Children

(Annals of Emerg Med, 2017)

► Limitations

- Meta-analysis, limited by the search indices
- Many studies were retrospective, relying on discharge diagnosis, may have missed children who developed complications during stay
- Limited by the quality of the studies available and the data provided

A systematic Review and Meta-Analysis of the Management and Outcomes of Isolated Skull Fractures in Children

(Annals of Emerg Med, 2017)

- ▶ Conclusions:
 - ▶ Very low risk of clinical decompensation for children with isolated nondisplaced skull fractures
 - ▶ Support the safe outpatient management for clinically stable children with an isolated linear nondisplaced skull fracture who are deemed to be at low risk of nonaccidental trauma
 - ▶ Consider period of ED observation
 - ▶ Should have a reliable outpatient follow-up plan

Post traumatic stress in children after injury

(Pediatric Emerg Care, 2018)

- ▶ Objective: This prospective, longitudinal study examined relationships between acute pain, opioid medications and PTSS after pediatric injury

Post traumatic stress in children after injury

(Pediatric Emerg Care, 2018)

- ▶ 1/5 injured children exhibit persistent post traumatic stress symptoms (PTSS) – for example, re-experiencing, avoidance, hyperarousal, dissociation, mood changes
- ▶ Studies have shown many factors related to PTSS development including: biological, psychological and environmental
- ▶ Less information available about the peritrauma phase

Post traumatic stress in children after injury

(Pediatric Emerg Care, 2018)

- ▶ Prospective study of 96 unintentionally injured children at a Level 1 trauma center (convenience sample)
- ▶ Children were ages 8-13 years old
- ▶ Researchers found that the highest pain reported during hospitalization predicted PTSS above and beyond effect of other risk factors
 - ▶ Thus level of pain can be used in the screening for concurrent and future PTSS and may be used to identify which children may benefit from counseling services

Abusive Injuries Are Worse Than Vehicular Injuries (Pediatr Emerg Care, 2017)

- ▶ Objective: compare injury severity and outcome of motor vehicle and nonaccidental traumatic injuries
- ▶ At a level 1 trauma center, reviewed data from 2005-2013
- ▶ Found that injury severity scores were significantly worse for patients with abusive injuries
- ▶ Those with abusive injuries had longer hospitalization rates and higher mortality rates
- ▶ During the 9 year period, admission rates decreased for vehicular injuries but remained constant for inflicted injuries

Abusive Injuries Are Worse Than Vehicular Injuries (Pediatr Emerg Care, 2017)

- ▶ Interventions have improved car safety, example more stringent car seat regulations, seat belts
- ▶ Efforts to reduce child abuse, have been more reactive in nature, and occur after the abuse has occurred.
- ▶ Its also more difficult to assess the effectiveness of prevention methods for nonaccidental trauma
- ▶ We need to further study the social factors related to abuse and determine how to intervene before the injury occurs

Conclusions

- ▶ We reviewed some recent literature
- ▶ We answered some clinically relevant questions
- ▶ Hopefully, we can incorporate the information into our practice