



Foundations I: Pediatrics 3 Teaching Points

Simple Febrile Seizure

- **Case Teaching Points**
 - The differential diagnosis should include febrile seizure, primary epilepsy syndrome, viral or bacterial meningitis, elevated intracranial pressure, metabolic disorder, trauma, congenital abnormality, GERD (Sandifer syndrome), breath-holding spells.
- **Febrile seizure definition**
 - A febrile seizure is a seizure accompanied by fever (temperature $\geq 100.4^{\circ}\text{F}$ or 38°C by any method) without concomitant evidence of CNS infection occurring in infants and children ages 6-60 months.
 - Simple febrile seizure: generalized seizure that lasts for < 15 minutes, no focality, and does not recur within a 24-hour period
 - Complex febrile seizure: seizure that lasts >15 minutes, has focal features, or recurs within 24 hours
 - Febrile status epilepticus: continuous seizure, or intermittent seizures without return to baseline, lasting for a period of >30 minutes
 - Febrile seizures are a diagnosis of exclusion, but this can be done with careful history taking and physical examination.
- **Febrile seizure epidemiology**
 - Approximately 2-5% of US children experience a febrile seizure between the ages of 6 months and 5 years.
 - The recurrence risk is approximately 1 in 4.
 - The risk of developing epilepsy with simple febrile seizures is only slightly higher than the background population risk of 1-2%. However, this risk increases to 5-10% with complex febrile seizures, febrile status epilepticus, family history of epilepsy, or any neurodevelopmental abnormalities.
 - There is an uncommon association between febrile seizure occurrence and DTaP and MMR vaccinations. This represents a genetic predisposition towards seizures and should not be regarded as a contraindication to vaccine administration.
- **Indications for diagnostic work-up**
 - Innumerable studies have demonstrated that there is no role in the evaluation of simple febrile seizures for neuroimaging, lumbar puncture, EEG, laboratory testing, or prolonged monitoring.

- AAP has published guidelines for performance of additional diagnostic testing:
 - Lumbar puncture: perform in a patient who has any meningeal signs or whose history and exam suggest a CNS infection, any unimmunized or underimmunized infant between 6-12 months (increased risk of invasive *H influenzae* type B and *S pneumoniae*). LP can be *considered* in children with fever and seizure that have been pretreated with antibiotics, with the rationale that early antibiotic therapy may mask signs of CNS infection.
 - EEG: do not perform in evaluation of simple febrile seizures.
 - CT head: do not perform in evaluation of simple febrile seizures. Abnormal findings are rare even in complex febrile seizures absent additional clinical concerns.
 - Laboratory tests: do not perform in evaluation of simple febrile seizures. (CBC, CMP, blood cultures, etc.)
- Diagnostic testing can be selectively considered based on the clinical scenario. Some of these factors include: febrile status epilepticus, prolonged postictal states, history of abnormal neurologic development, any concern for CNS infection, or testing needed for evaluation of the underlying febrile illness.

- **Treatment**

- Treatment for the index seizure is purely supportive or addressed towards management of the source of the febrile illness.
- Antipyretics can be administered for comfort. However, these are unlikely to prevent short-term recurrence of seizure.
- Children in febrile status epilepticus should be treated with standard therapy according to standard pediatric seizure guidelines. Benzodiazepines are first-line agents. Second line choices include fosphenytoin, levetiracetam, valproate, and phenobarbital.
- Prophylactic antiseizure medications are rarely indicated given the benign course of most febrile seizures, as well as the attendant side effect profiles with many anticonvulsant drugs.

- **Counseling**

- Although febrile seizures are often diagnostically simple, counseling parents who just witnessed their child have a febrile seizure can be much more challenging, particularly without additional emergency testing performed.
- Describing how common they are may be helpful; 2-5% of the population corresponds to roughly 1 child per kindergarten class nationwide.
- Antipyretics are unlikely to prevent the recurrence of febrile seizures with illnesses in the future. This can relieve some of the burden from the parent and help combat “fever phobia.”
- Recurrence risk may be higher in those who have seizures at a younger age (< 15 months), frequently have febrile illnesses, have a parent or sibling(s) with febrile seizures or epilepsy, or show a short latency between onset of fever and seizure.

- **Attributions**

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- **References:**

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Intussusception

- **Case Teaching Points**

- The differential for this 8 month old child with paroxysms of abdominal pain and vomiting should include intussusception, appendicitis, testicular torsion, pancreatitis, hepatitis, biliary disease, SBO, mass lesion, hernia, volvulus, UTI, DKA, and trauma (including non-accidental trauma).

- **What is the pathophysiology of intussusception?**

- Intussusception is the most common cause of intestinal obstruction in children under 2, with peak incidence in infants 5 to 12 months old. It can occur in children up to 5 or 6 years, but intussusception occurring older than 6 years requires a workup for a pathological lead point.
- The pathophysiology behind intussusception is, theoretically, a lead point that causes telescoping of one segment of intestine into another. Recurrent episodes cause edema which obstructs venous return, which eventually leads to ischemia of the bowel wall, peritoneal irritation, and possibly perforation.
 - 80% of cases occur when the terminal ileum invaginates through the ileocecal valve into the cecum, known as “ileocolic intussusception”

- **What is the presentation of intussusception?**

- A “classic” presentation for intussusception includes abdominal pain, vomiting, and bloody stools. However, less than $\frac{1}{3}$ of patients present with all 3 symptoms and up to 20% of patients are asymptomatic at presentation.
- A classic presentation includes cyclical episodes of severe abdominal pain in which the child is “inconsolable” and often draws the legs up towards the abdomen. Each episode usually lasts 10 to 15 minutes and occurs every 15 to 30 minutes. Patients are generally asymptomatic in between episodes.
- Late presentations with intestinal ischemia cause sloughing of intestinal tissue in the stool. In these cases, the family may report unusual stools which contain mucus and blood (test buzzwords = “currant jelly”).

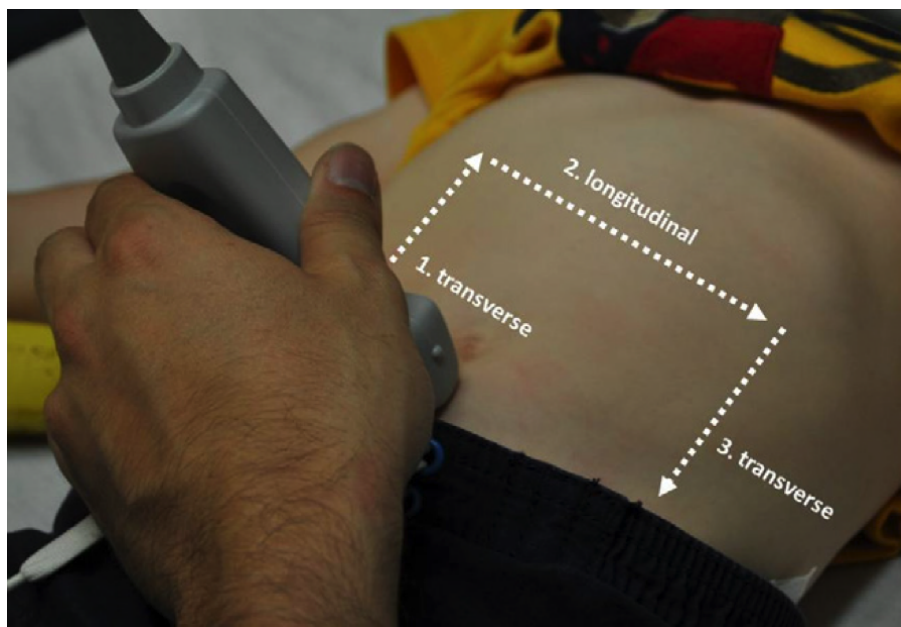
- **What are the physical exam findings for intussusception?**

- Dance’s sign: “sausage-like” mass in the RUQ at the location of the intussusception and an empty space in the RLQ (typical location of the cecum). This is most easily, but still rarely, palpated with the child in a sitting position and the provider cupping the fingertips under the epigastric region.
- Some children present only with lethargy, and may even respond to narcan. This is thought to be due to release of endogenous opioids. Therefore, intussusception should be considered in a young child presenting only with lethargy (true clinical lethargy, not parent reported “lethargy”).
- Stool may be positive for gross or occult blood.

- Peritoneal signs on exam (rigid abdomen, involuntary guarding) should prompt immediate surgical consultation and is a contra-indication for enema.
- **What are the radiographic findings seen in intussusception?**
 - POCUS is a highly sensitive and specific tool for diagnosing intussusception rapidly at the bedside, however it is a more advanced application that takes some practice. Formal abdominal ultrasound is appropriate. Findings include the classic “doughnut sign”.
 - Abdominal XR should be considered in addition to ultrasound for patients with a broad differential or clinical concern for perforation or obstruction. A 2-view XR including left lateral decubitus is best. Normal gas pattern in the RLQ is reassuring. Pathologic findings may include a paucity of gas in the RLQ, soft tissue mass, “target sign” (round mass of soft tissue with concentric lucency) or obstructive features. Free air may be seen with intestinal perforation and is a contraindication for enema reduction- emergent surgical intervention is then indicated.
- **What is the appropriate management for intussusception?**
 - Resuscitate dehydration with IVF and provide symptomatic care for pain/vomiting.
 - Consider placing a NG tube for patients with prominent distention and vomiting.
 - If you are concerned for perforation, send blood cultures and start antibiotics (Ceftriaxone 50 mg/kg IV + Metronidazole 10 mg/kg IV or similar)
 - When the diagnosis is suspected, early pediatric surgery consultation is important.
 - For patients who are clinically stable and < 3 years, air or contrast enema may be both diagnostic and therapeutic.
 - Surgical management is often required for patients who are > 3 years or have complications including obstruction or perforation.
- **POCUS Pearls** (time permitting)
 - For small children, like in this case, the high frequency linear transducer should be the probe of choice.
 - See [Figure 69.4](#): start with the probe transverse just above the bladder, slide the probe laterally toward the right lower quadrant until you find the iliac vessels and the psoas muscle, slide the probe cephalad towards the liver scanning along the ascending colon, rotate the probe 90 degrees (indicator oriented cephalad) and sweep until the spleen is visualized, rotate the probe back 90 degrees (indicator towards patient’s right) and sweep toward the left lower quadrant
 - This technique can be repeated in order to scan the small bowel as well, starting just medial to the previous spot in the RLQ and again sweeping to the RUQ, LUQ, then LLQ
 - Intussusception is identified when you visualize one of the classic US findings: “target” or “donut” sign in transverse and “pseudokidney” or “sandwich” sign in longitudinal (see [Figure 69.5](#) below); this is most often located in the RUQ
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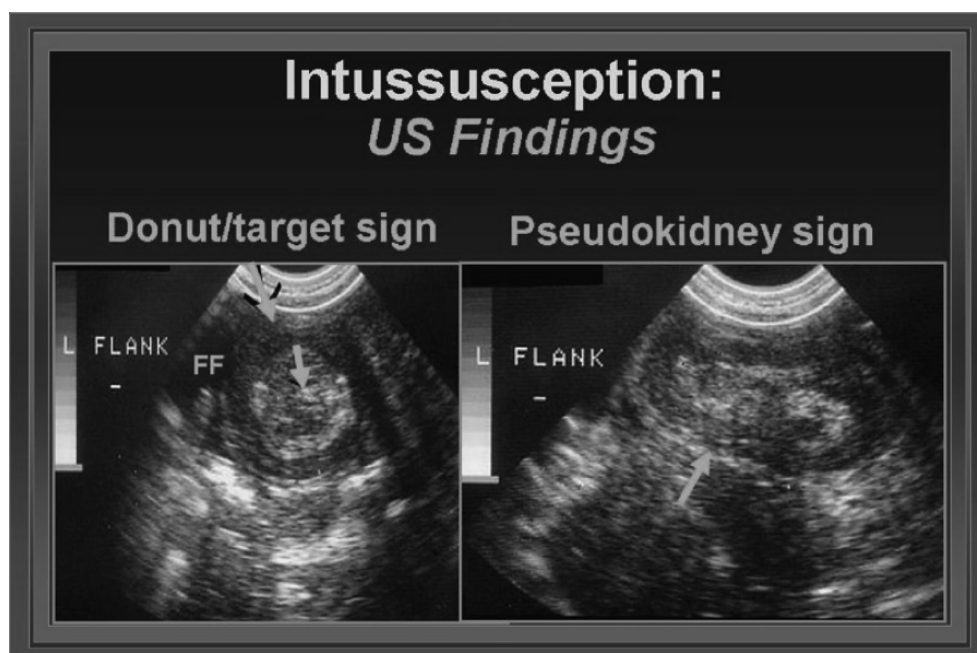
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 - Image References
 - Abdominal XR from Radiopedia: <https://radiopaedia.org/cases/intussusception-13?lang=us>
 - POCUS images courtesy of: Emory Emergency Medicine POCUS Archive

Figure 69.4- Technique for Intussusception Scanning



[Back to teaching points](#)

Figure 69.5- Classic POCUS Findings of Intussusception



[Back to teaching points](#)

Non-accidental Trauma (NAT)

- **Case Teaching Points**

- The differential for non-bloody non-bilious emesis in a child is relatively broad and includes infectious processes like viral gastroenteritis, obstructive processes like intussusception or volvulus, reactions to breast milk/ formula or possibly solid foods, accidental ingestions, inherited genetic disorders such as enzyme deficiencies, trauma and intra-abdominal organ injury, and also includes intracranial pathology such as tumors/masses/bleeds.
- In particular for this patient with scattered bruising, signs of head trauma and inconsistent history, non-accidental trauma should be fully evaluated.

- **What historical features should raise the index of suspicion for non-accidental trauma?**

- Physical abuse of children is common, potentially fatal, and too often goes unrecognized in the acute care setting. NAT should be considered in every patient encounter.
- Abuse is most prominent in children under 4 and highest risk for children under 1.
- Abuse is more common for children with developmental delay, chronic illness, colic, or “behavioral issues”.
- Parents or biological relatives are found to be responsible for child abuse in 90% of cases.
- Abuse occurs in households of all ethnic and socioeconomic backgrounds.
- Spanking/beating children as a form of punishment is harmful and should not be dismissed.
- In particular, concerning historical features include:
 - Inconsistencies between the reported history and physical exam findings
 - History of reported events changes over time or differs from different historians
 - Delay in seeking care
 - Injury mechanisms that are incompatible with developmental age:
 - Rolling over: 4-6 months
 - Crawling: 7-12 months
 - Walking: 10-18 months
 - Limited concern on the part of the caregiver

- **What are some physical examination findings that should raise the index of suspicion for non-accidental trauma?**

- Bruising is the most common finding in abused children; a single bruise may be the only finding.
 - In non-mobile children, bruising is caused by abuse in 50% of cases.
 - Ten-4 FACES: Torso, Ears, Neck, < 4 months, Frenulum, Angle of jaw, Cheek, Eyelid, Subconjunctival hemorrhage
 - Patterned bruising (fingers, hands, belt buckles, coat hangers, etc) is highly concerning.
 - Bruising to soft areas (buttock, abdomen, etc) as opposed to bony prominences

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- Fractures are the 2nd most common finding in NAT. The following fracture patterns are most concerning:
 - Any fracture in a non-mobile child
 - Any long bone in child < 18 months
 - Sternal, scapular, posterior rib, or spinous process fractures
 - Multiple fractures of different ages
 - "Bucket-handle" or metaphyseal "corner fracture"
 - Spiral fx except distal tibia in a walking child (Toddler fx)
 - Complex skull fractures
- Burns with characteristic patterns:
 - Scalding injuries on upper extremities, head, neck, torso may be consistent with accidental splashes, assuming the exam and child's developmental level match the reported history.
 - Intentional submersion/scalding should be suspected in patients with symmetric burns, stock/glove distribution on arms or legs, and well demarcated burns.
 - Patterned burns (cigarette burns, curling iron, etc) are concerning.
- Head injury accounts for 80% of deaths in non-accidental trauma cases; maintain a high index of suspicion and obtain CT imaging for concerning historical features or exam findings (head/facial ecchymosis, hemotympanum, scalp hematoma, etc).
- **What is the appropriate ED workup for suspected non-accidental trauma?**
 - Place an IV line and order labs to evaluate for traumatic injury (or other diagnoses on the differential).
 - CT head should be performed to rule out intracranial bleeding for all children with visible signs of head trauma and in all children < 1 yr, even if visible signs of head trauma are not present (open fontanelle may mask typical signs of increased ICP).
 - If head injury is suspected, also consider cervical spine injury, particularly for abused children with Down's syndrome (higher risk of atlanto-occipital instability).
 - Routine CT chest, abdomen and pelvis is not recommended but should be considered if there are physical exam or laboratory findings suggestive of injury to those areas.
 - If highly suspicious or confirmed nonaccidental trauma, ophthalmology should be consulted to evaluate for retinal hemorrhage as a sign of shaken baby syndrome.
 - A skeletal survey is an important way to identify occult and old injuries in suspected NAT and should be considered in all children under 5 yrs.
 - Recommended for children < 2 years
 - Children 2-5 years- consider skeletal survey vs focused imaging based on hx/exam
 - The skeletal survey is lower yield in children > 5 yrs; imaging should be determined by history and exam
 - Skeletal survey may be deferred to the inpatient team.
 - The skeletal survey is typically repeated after 10-14 days.

- When injuries are identified, admit the patient to a safely monitored space for continued evaluation and treatment.
- If the ED workup is reassuring without identified injury requiring admission, discharge may be considered if the child is returning to a safe environment (as determined after social work and DCFS evaluation). Often, patients require an observation admission while home safety is being investigated.
- **What is the obligation to report findings concerning for child abuse?**
 - For physicians in the United States, there is a mandatory reporting of suspected child abuse, with state by state variation in required reporting for other adults and professions. Social workers, teachers, coaches, child care providers, and law enforcement officials are generally required to report known or suspected abuse.
 - Social work and DCFS should be notified in any case of suspected abuse. Engage a child abuse specialist when available.
- **What is the best way to communicate the concern for non-accidental trauma?**
 - Practice self-awareness and address your own personal emotions prior to engaging caregivers to avoid emotionally charged or accusatory language.
 - Coordinate with other members of the patient care team to ensure clear and consistent communication with the family.
 - The child's primary caregivers should be informed about a concern and the process for evaluating non-accidental trauma.
 - Avoid using medical terminology or words like "abuse".
 - Clarify that because the child has an injury, more tests are needed to make sure there aren't any other injuries. We are also required to make a report to Child Protective Services.
 - Normalize this by saying the same evaluation and reporting would be done for any child who presents with a similar injury.
 - Emphasize the need to ensure the child's safety without accusing the caretakers of abuse or hypothesizing the mechanism of injury.
 - Provide simple but accurate explanations of the tests that will be performed and the process to obtain them, including discussion of radiation exposure as needed.
 - Acknowledge that the process is stressful and time-consuming for the family.
 - Recognize that abuse towards other members of the household (mother, other children, etc) may be occurring. This should be investigated sensitively in coordination with DCFS and social work.
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