Hot Topics in Pediatric Infectious Disease

PIAA Claims/Risk Management Workshop
Wendi K. Drummond DO, MPH
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Roadmap

- Brief review of Pediatric Medical Professional Liability
- Review the top three infectious disease diagnoses in pediatric malpractice claims
- Brief discussion of emerging infectious disease issues in the pediatric population

“KIDS ARE NOT LITTLE ADULTS”
Pediatric Medical Professional Liability

- Usually associated with a delay in diagnosis or treatment or misdiagnosis
- Some of the largest settlements involve pediatric cases
- Associated with degree of impairment and/or need for lifetime care
- Large emotional impact on a jury in cases involving a deceased or severely injured child

Goals

- Increase patient safety
- Identify areas of opportunity for intervention to increase patient safety
- Reduce risk of medical malpractice exposure

Meningitis

- One of the most expensive medical conditions for indemnity and defense costs
- Patient death or severe neurological impairment
- Problems associated with misdiagnosis or delay in treatment
**Meningitis**

- Inflammation of the meningeal layers of the CNS
- May be caused by infection, medications, or malignancy; most commonly caused by infection
- Infectious etiologies include bacteria, viruses, fungus and parasites

**Meningitis: Pathophysiology**

- May be a complication of infection in the blood, a result of trauma or iatrogenic causes
**Viral Meningitis**

- Most common cause of meningitis
- HSV, enterovirus, CMV, EBV, and others
- HSV can cause a severe clinical syndrome
- In general, viral meningitis causes much less morbidity and mortality and is associated with fewer liability claims
- Should not be confused with aseptic meningitis

**Bacterial Meningitis**

- One of the most serious infections in infants and children
- Associated with some devastating complications and sometimes death
- Timely and accurate diagnosis and treatment is critical
- Sequelae include hearing loss, developmental delay, and seizures

**Bacterial Meningitis**

- Highest incidence of disease in ages 0-2
- Neonates at highest risk, followed by infants aged 3-8 months
- Vaccines have made a tremendous impact on the reduction of certain types of bacterial meningitis
Bacterial Meningitis: Symptoms

**Infants**
- Fever
- Irritability
- Lethargy*
- Decreased liquid intake
- Vomiting
- Rash
- Stiff neck
- Bulging fontanelle
- Seizures

**Children > 1 y.o.**
- Fever
- Nausea and vomiting
- Headache
- Photophobia
- Confusion
- Lethargy
- Neck stiffness or pain
- Rash
- Seizures

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**Sutures remain open in babies and fuse as they age. Functions as a pop off valve.**

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**Indicative of increased intracranial pressure**
Bacterial Meningitis: Diagnosis

- Lumbar puncture to obtain CSF for analysis and culture
- CSF studies may be suggestive, but not always diagnostic
- Positive culture confirms diagnosis but culture not always positive even in patients with meningitis*
- Other diagnostics: Streptococcal antigen, PCR testing

Bacterial Meningitis: Treatment

- Treatment often initiated prior to obtaining CSF or having results back given the critical nature of the disease
- Appropriate antibiotic therapy targeted at likely pathogens with good CNS penetration
- Supportive care
- Steroids

* Good clinical history and high index of suspicion is key
Meningitis: Medical-Legal Issues

- Diagnosis can be difficult to make
- Presenting signs and symptoms may be subtle and mimic other clinical syndromes
- Primarily a pediatric problem
- 60% of claims in <2 y.o.
- Most common action: delay in diagnosis

Initial Diagnoses in Meningitis

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Viral Infection/Influenza</td>
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<tr>
<td>Other</td>
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<tr>
<td>Meningitis</td>
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<tr>
<td>Ear Infection</td>
<td>12.3</td>
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<td>Urinary tract infection</td>
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<tr>
<td>Post-operative infection</td>
<td>2.7</td>
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<tr>
<td>Migraine</td>
<td>2.7</td>
</tr>
<tr>
<td>Febrile Seizure</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Adapted from table in McAbee et al. 2008. Data obtained from PIAA Data Sharing Project 1985-2006.

Meningitis: Medical-Legal Issues

- 25% of children did not present with fever
- Lumbar punctures were not performed in approximately 30% of cases resulting in claims
- Risk management is challenging given frequent absence of symptoms at presentation
Meningitis: Medical-Legal Issues

- PIAA Meningitis Study 2000:
  - Claims based on cases in which the initial contact of the patient/caregiver was by phone were more than twice as costly to settle than claims based on cases where contact occurred face to face


Meningitis: Medical-Legal Issues

- PIAA Meningitis Study:
  - Key factor: delayed physician response time → delay in diagnosis
  - Not responding to a call in a timely manner
  - Delay or failure to perform appropriate diagnostics
  - Delay in initiating appropriate therapy
**Appendicitis**

- Perplexing diagnostic problem
- Difficult to diagnose, especially in young children
- Perforation rate is higher, the younger the child; accurate diagnosis critical
- Missed diagnosis reported in up to 27% of cases


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**Appendicitis**

- Frequently misdiagnosed in females (UTIs, pelvic inflammatory disease)

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“...You’re lucky. In my day the doctor beat you with a stick until your appendix fell out...”
Appendicitis

- Most common condition in children requiring emergency abdominal surgery
- Key to successful outcome is early diagnosis and appendectomy prior to complications
- Gangrene, perforation

Appendicitis

- Older children and adolescents develop appendicitis more often than younger children
- Have clinical syndrome more similar to that of adults
- Younger children more difficult to diagnose due to vagueness of presentation
- Anxiety and cooperation more of a challenge

Appendicitis

- Caused by obstruction of the appendiceal lumen
- Obstruction → colic → poorly localized abdominal pain
- Bacterial overgrowth → invasion of the wall → inflammation and ischemia → gangrene → perforation
- Perforation rare in the first 12 hours; increases after 72 hours
Appendicitis

- Delay in diagnosis is common (up to 57% of cases in children less than 6 years of age)
- Perforation correlates with delayed diagnosis.
- Risk of perforation highest up to age 4 (more than 70% of children in this age group)


Appendicitis

- Classic features:
  - Fever
  - Anorexia
  - Migration of pain to right lower quadrant
  - Rebound tenderness
Appendicitis

- Atypical symptoms not uncommon
- May include diarrhea, URI symptoms, constipation, lack of fever
  - Diagnosis can be challenging in children due to anxiety and discomfort
  - Symptoms like vomiting and irritability are nonspecific and occur in common disorders of childhood

Appendicitis: Clinical Features

- Irritability and lethargy in newborns
- Generalized abdominal pain in infants and young children
- Vomiting before abdominal pain
- Diarrhea, constipation and dysuria

Mimickers of Appendicitis:
Abdominal Causes

- Gastroenteritis
- Constipation
- Perforated ulcer
- Intussusception
- Small Bowel Obstruction
- Crohn's Disease
- Meckel's Diverticulitis
Mimickers of Appendicitis: Extra-abdominal causes
- Pneumonia
- Hemolytic Uremic Syndrome
- Streptococcal pharyngitis
- Urinary tract infection
- Diabetic Ketoacidosis
- Nephrolithiasis (kidney stones)
- Pelvic Inflammatory Disease

Appendicitis: Diagnosis
- Complete blood count
- Abdominal Ultrasound
- CT scan abdomen and pelvis
- High index of suspicion and timely evaluation by a surgeon

Pneumonia
- Second highest average indemnity paid out since 2001
- Average indemnity for errors in diagnosis: $396,318

McAbee et al.
Pneumonia

- Presenting signs and symptoms can be very non-specific
- Presentation can vary depending on the pathogen, age of the patient, and severity of the disease
- No single sign or symptom is diagnostic
- Symptoms may be very subtle in infants and young children

Pneumonia

- Cough may not be a cardinal feature in infants and young children
- Rapid or increased work of breathing may occur prior to cough
- Neonates and infants:
  - Difficulty feeding
  - Restlessness
  - Fussiness

Pneumonia: Presentation

**Young Children <5-10 y.o.**
- Fever: may be the only sign of occult pneumonia in young children
- Elevated white count
- Rapid breathing: very sensitive and specific sign of radiographically confirmed pneumonia

**Older Children**
- Chest pain with deep inspiration
- Main symptom may be ABDOMINAL pain
- Classic features:
  - Cough
  - Chest pain
  - Shortness of breath
  - Fever
Pneumonia: Types
- Community Acquired: acute infection in the lungs acquired in the community
- Nosocomial: hospital acquired

Pneumonia: Etiology
- Bacterial
- Viral
- Atypical
- Fungal
- Mycobacterial
  - No single clinical feature a reliable indicator of type of pneumonia

Pneumonia: Diagnosis
- Complete blood count
- Serum electrolytes
- Acute phase reactants (CRP, ESR)
- Blood culture
- Sputum culture
- Rapid diagnostic tests: PCR testing
- Urine antigen testing: Legionella, Histoplasmosis
- Chest radiograph
**Mimickers of Pneumonia**

- Bronchiolitis
- Heart failure
- Sepsis
- Metabolic acidosis
- Foreign body aspiration
- Long list of non-infectious disorders that may present similarly to pneumonia

*Patients may present with fever, tachypnea and cough

**Pneumonia: Treatment**

- Early treatment with likely pathogen directed therapy to prevent complications:
  - Pleural effusion and empyema
  - Necrotizing pneumonia
  - Lung abscess
  - Fistula formation
  - Hyponatremia

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*Is it just a cough? Or is it pertussis/whooping cough?*
**Pertussis: The Basics**

- Coughing fits from pertussis can last up until 10 weeks or more: hence, the “100 day cough”
- Vaccinated children and adults can develop infection and transmit the infection to others
- Protection from the childhood vaccine fades over time, therefore putting individuals at risk for infection and transmission
- More than half of infants with pertussis have to be hospitalized

**Epidemiology**

- Incidence decreased since institution of vaccine in 1940s (200,000 cases formerly reported annually)
- Incidence has decreased more than 80% compared to the pre-vaccine era
- We saw a change in 1980s: increase in the number of cases in 10-19 year olds and in less than 6 months of age
- 2010: 27,550 cases reported

**Epidemiology**

- Some studies have suggested 20-40% of adults with persistent cough may have pertussis
- IN 2010, 27,550 CASES OF PERTUSSIS (WHOOPING COUGH) WERE REPORTED IN THE U.S., BUT MANY MORE GO UNDIAGNOSED AND UNREPORTED.
- MORE THAN HALF OF INFANTS LESS THAN 1 YEAR OF AGE WHO GET PERTUSSIS MUST BE HOSPITALIZED.

Reported Pertussis Incidence by Age Group

- The prior graph shows incidence by age group (per 100,000 population) from 1990-2010.
- Infants aged less than 1 year of age, who are at the highest risk for morbidity and mortality continue to have the highest reported rates of pertussis.
- Adolescents (11-19) and adults (>20) accounted for approximately 44% of cases, as well as 7-10 year olds (19%).
Outbreaks

- Endemic disease in the U.S. with periodic outbreaks every 3-5 years
- Pertussis outbreaks can be difficult to identify and manage due to clinical symptoms similar to other respiratory syndromes that may be co-circulating in the environment
- PCR testing and culture confirmation of at least one suspicious case recommended

Recent Outbreak Activity

- Washington State: 3,484 cases through August 11, 2012 (94+ cases reported in 2011 through the same time period)
- California: 2010 (9,143 cases with 10 infant deaths)
- Colorado: January 1-September 1 2012: 806 cases reported (compare to an average of 176 cases reported during the same period 2007-2011)

Diagnosis

- There may be in delay in diagnosis due to overlapping clinical syndromes/symptoms
- Physicians need to have a high index of suspicion in order to initiate treatment
- In infants, treatment is primarily supportive, but mortality can be high if not identified
- Treatment typically decreases duration of symptoms and transmission
Diagnosis

- Gold standard is culture
- PCR testing considered to be modality of choice

Other Hot Topics

- Necrotizing fasciitis
- MRSA and MSSA Infections
- Vaccine Preventable Diseases and Vaccinations
  - Common vaccine myths including the purported link to autism

References

- Carroll AE, Buddenbaum JL. Malpractice Claims Involving Pediatricians: Epidemiology and Etiology. Pediatrics. 2007;120;10