Fever in Infants Under 3 Mon.

Dr. Bob Wilson  Golden BC
What is the risk of serious bacterial infection in a febrile 2 month old infant?

• A. 5%
• B. 10%
• C. 25%
• D. 50%
• E. 100%
What is the most common congenital viral infection?

- A. Herpes simplex
- B. Rubella
- C. Varicella
- D. Rabies
- E. CMV
A 3 week old infant presents with fever > 38 degrees C. You will -

• A. Give acetaminophen and reassure the parents
• B. Take a blood culture and commence IM ceftriaxone as OP
• C. LP, urine and blood culture, chest x-ray, initiate ampicillin and gentamycin IV as IP
• D. Ask Dr. Blondel-Hill
I have no financial interests or other relationship with any pharmaceutical company. I have no other conflict of interest to report.

Unfortunately
Learning Objectives

• Infants < 3 mon represent a special group for assessing possible causes of fever due to their intrinsic susceptibility to serious bacterial infection and particular risks of exposure

• Infants < 1 mon are the high risk group within the high risk group
Definition

• Rectal temp > 38.0
• Tympanic, temporal, axillary may be inaccurate
• ? Excessively bundled – remeasure 20 min. after unbundling
Conditions Beyond Scope of My Talk

- Infection in VLBW infants
- Neonates in nursery
What me worry?
Why are Infants at Risk?

- Hold over from neonatal period
- Infections acquired in nursery but expressed later
- Increased susceptibility (poor ability to localize infection)
- Congenital infections
How Concerned Should We Be

- infants < 2 mon with documented fever
- 10% serious bacterial infection
- 3% bacteremia or bacterial meningitis
Difficulty in “Reading” Infants

- Non specific physiologic responses elevations in HR and RR dependant on fever
- History dependant on caregivers – some may not be present
- Localizing signs of inflammation may not be present (eg meningismus)
Fever in Infants < 3 months

- Infection
- Infection
- Infection
- Other:
  - Neurosurgical – CNS bleed, tumor
  - Abdominal – NEC, intussusception
  - Inflammatory – variants of Kawasaki’s, lupus
  - Metabolic – hyperthyroidism, volume depletion, electrolyte etc
  - Drug related
Types of Infection to Consider

- Bacterial
- Viral
- Protozoan
- Fungal (mainly VLBW infants with central lines and/or TPN)
Congenital Infections
Storch

• Syphilis
• Toxoplasmosis
• “Others” (influenza, varicella, et cetella)
• Rubella
• Cytomegalovirus
• Herpes Simplex
## Incidence in USA

<table>
<thead>
<tr>
<th>Agent</th>
<th>Per 100,000 births</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMV</td>
<td>1000</td>
<td>40,000</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td>100</td>
<td>4000</td>
</tr>
<tr>
<td>HSV</td>
<td>20</td>
<td>800</td>
</tr>
<tr>
<td>Syphilis</td>
<td>10</td>
<td>400</td>
</tr>
<tr>
<td>Rubella</td>
<td>&lt;1</td>
<td>5</td>
</tr>
</tbody>
</table>
**Number of Neonates With Symptoms At Birth Is Small**

<table>
<thead>
<tr>
<th>Agent</th>
<th>Total Cases</th>
<th>Symptomatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMV</td>
<td>40,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td>4,000</td>
<td>1,000</td>
</tr>
<tr>
<td>HSV</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>Syphilis</td>
<td>400</td>
<td>130</td>
</tr>
</tbody>
</table>
Serious Bacterial Infections in Febrile Infants

- Bacteremia
- Meningitis
- Osteomyelitis/Suppurative Arthritis
- Skin/Soft Tissue Infection
- Urinary Tract Infection
- Gastroenteritis
- Pneumonia
Common Bacterial Pathogens in Febrile Infants

- Gp B streptococcus
- E. coli
- Salmonella sp.
- Streptococcus pneumoniae
- Staphlococcus sp – esp MRSA
- Hemophilus influenzae type b, non typeable
- Enterococcus
- Listeria monocytogenes
- Neisseria meningitidis
Less Common Pathogens

- TB
- Pertussis
- Chlamydia
- Syphilis
- Malaria
History

- Pregnancy, birth wt and maturity, neonatal illness or prolonged stay in nursery? ICN
- Change in feeding, vomiting, diarrhea, blood in stools
- Respiratory Sx: rhinorrhea, cough, distress
- Measured temp?
- Parental intuition
- Intercurrent illness in family, sibs in daycare, immunization, family cocooned?
Physical Exam

- Rectal temp, vital signs, O2 sat
- Volume status
- CNS – interaction, fontanel, meningeal irritation
- Respiratory: URI?, flaring alae, retractions, work of breathing, lobar consolidation, wheeze, cyanosis
- Cardiac: peripheral circulation, pallor, hyperdynamic precordium
Exam cont’d

• Abdomen: distension, tenderness, organomegally, bowel sounds
• Skin and soft tissues: rash, petechiae, purpura, jaundice, arthropathy
• Trial feed
Infants under 1 Month

• Sepsis workup – must include LP due to late onset gp B strep meningitis
  (CBC, urine R/M, culture blood, urine, other, chest x-ray, pos. stool WBC and culture)
• Consider herpes simplex esp. if seizure or lesions
• Consider Chlamydia if pneumonia
• Consider S. aureus if nursery stay, family member colonized
Infants 30-90 Days

- Ill appearing, signs of possible localizing infection or decompensation
  - Sepsis workup including LP
  - Anticipatory treatment
- Well appearing with possible benign explanation
  - Limited workup
  - +/- Anticipatory treatment
- Follow up
## Group B Strep Sepsis

<table>
<thead>
<tr>
<th>Year</th>
<th>Early Onset &lt; 7 days</th>
<th>Late Onset 7-89 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>1.7/1000 births</td>
<td>0.3/1000 births</td>
</tr>
<tr>
<td>1997</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>2009</td>
<td>0.26</td>
<td>0.3</td>
</tr>
</tbody>
</table>
Herpes Simplex
Dr. Sara Long’s way

• Age < 21 d  fever/hypothermia without focus or vesicles/oral lesions and CSF pleocytosis
• Virus culture conjunctiva, throat, rectum
• PCR CSF for herpes virus, antigen detection for bacterial pathogens (and gm stain)
• Bacterial culture CSF, blood, urine + other
• Acyclovir 60 mg/kg/d div Q8H x 21 d  IV + antibiotics (amp and genta)
Treatment of Suspected Bacteremia or Meningitis

- Ampicillin 200-400 mg/kg/d IV div Q6H (max 12 gm/d) some adjustment for age and premis
- Gentamycin 2.5 mg/kg IV Q8H – alternate 6.5 mg/kg/d once daily (5 mg/kg 8-30 d) many adjustments for age and maturity adjust based on levels
- If staph or resistant S. pneumo suspected add vancomycin 15-20 mg/kg Q8H (age > 1 mon 10-15 mg/kg Q6-8 H) adjust in neonates
- Older than 2 mon may use ceftriaxone or cefotaxime +/- vanco (remember Ca with ceftriaxone restriction)
Incidence rate: cases per 100,000

Changes in Pneumococcal Disease

FIGURE 1. Changes in incidence rate* of invasive pneumococcal disease (IPD) among children aged <5 years before and after introduction of 7-valent pneumococcal conjugate vaccine (PCV7), by age and year — Active Bacterial Core surveillance, eight states,† 1998–2005
Etiology of Pneumonia in Neonates

- Gp B Strep
- Staph aureus
- Gm –ve enteric organisms
- Strep. pyogenes
- Listeria
- Chlamydia trachomatis
- CMV
- RSV
Etiology of Pneumonia in Infants

- RSV, parainfluenza, influenza, adenovirus
- Streptococcus pneumoniae
- Haemophilus influenza (non-typable)
- Mycoplasma pneumoniae
- Pertussis
- Chlamydia sp
- TB
## Pneumonia Treatment


if staph aureus suspected add Clox or Vanco

<table>
<thead>
<tr>
<th>Age</th>
<th>OP</th>
<th>IP — no lobar infiltrate or effusion</th>
<th>IP - severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth – 20 d</td>
<td>Admit</td>
<td>Amp + Genta +/- Cefotaxime</td>
<td>Amp + Genta +/- Cefotaxime</td>
</tr>
<tr>
<td>3wk–3mon (afebrile)</td>
<td>Erythro or Azithro</td>
<td>Erythro or Azithro</td>
<td>N/A</td>
</tr>
<tr>
<td>3wk-3mon (febrile)</td>
<td>Admit</td>
<td>Cefotaxime</td>
<td>Cefotaxime or Amp (high dose)</td>
</tr>
</tbody>
</table>
Protecting Infants Against Pertussis

- Immunize
- Cocoon (immunize sibs and caregivers)
- Treatment is only effective for shortening symptoms when started in catarrhal phase
- Treatment does shorten period of infectivity
Patient 1

- 2 ½ month male infant with one day of fever to 38.0 (axilla), rhinorrhea, decreased breast feeding duration but increased frequency
Patient 1

- No problems in pregnancy, delivery or neonatal period
- Breast feeding has progressed normally
- Intercurrent respiratory illness in mom and one older sibling
Patient 1

- Appears well hydrated, interacts normally with parent and examiner, demonstrates ability to feed on breast
- No markers of CNS disease (not full fontanelle, meningeal irritation, lethargy or hyperirritability)
- Mild rhinorrhea and pharyngeal injection, otherwise NAD on examination
Patient 1

- Does this patient need more evaluation
- Can we just send them home?
- What other factors might we consider?
Rochester Criteria (variants Yale, Harvard)

- Ill or well appearing, previously healthy?
- Term (> 37 wk)
- WBC > 20 x 10⁹/l, bands > 1.5
- Urine bag dip/cath – positive leuk esterase, greater than 10 WBC/hpf spun urine
- If diarrhea, > 5 WBC/hpf
- Telephone, transportation, reliable, able to follow in 24 hr
Patient 2

- 4 week old infant female with two days of reduced feeding, now fever of 38 and has vomited last two feeds
Patient 2

- Babe is lethargic in mom’s arms, fails to feed
- “looks ill”
- Normally hydrated
- Fontanelle fails to depress when held upright
- Babe emits high pitched cry with diaper change
Patient 2

• What further investigations does this babe need?
• What treatment would you initiate?
• Admit?
• Transfer?
• Escort?
Conclusions

• Fever in infants < 3 mon represents a higher than usual risk of serious infection
• Fever in infants < 1 mon is especially concerning and always warrants full work up, admission for close observation and anticipatory treatment
• The expression “a high index of suspicion” particularly applies to assessing sick infants
What is the risk of serious bacterial infection in a febrile 2 month old infant?

• A. 5%
• B. 10%
• C. 25%
• D. 50%
• E. 100%
What is the most common congenital viral infection?

- A. Herpes simplex
- B. Rubella
- C. Varicella
- D. Rabies
- E. CMV
A 3 week old infant presents with fever > 38 degrees C. You will -

• A. Give acetaminophen and reassure the parents
• B. Take a blood culture and commence IM ceftriaxone as OP
• C. LP, urine and blood culture, chest x-ray, initiate ampicillin and gentamycin IV as IP
• D. Ask Dr. Blondel-Hill