Title of case: 25 day old male with fever
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Learning Objectives: KAS 8-14

HPI: A 25 day old M, born via normal spontaneous vaginal delivery at 40 weeks and 2 days, is brought to the clinic for fussiness and an axillary temperature of 38.5^{o}C this morning . The parents checked a temperature when he wouldn't take a bottle this morning like he normally would. Parents deny any cough, congestion, rhinorrhea, vomiting, diarrhea, or otherwise foul smelling diapers. The child previously had been taking 1.5 ounces of formula per feed, every 2-3 hours, and has had 6 wet diapers and 4 stools in the past day. Parents deny any sick contacts and are in good health. On examination he is comfortably asleep without any signs of distress.

Pertinent ROS:

- Fussy with poor PO intake
- No cough, congestion, or rhinorrhea
- No vomiting, diarrhea or otherwise foul smelling diapers
- No rashes

Birth hx: ex 40 weeks and 2 days, NSVD, uncomplicated nursery course, GBS negative, rupture of membranes for 10 hours with clear fluids
No PMH, PSH, Meds, or allergies
Imm: received HBV vaccine at birth
Dev: normal for age
Social hx: lives with mom and dad, no siblings
Family hx: paternal grandmother with diabetes and hypertension, maternal grandfather with atrial fibrillation

Vitals: 38.7 ^{o}C (rectal), heart rate 185, 75/52, RR 44, satting at 99%
PE:

GENERAL APPEARANCE: well-nourished, well developed
HEAD: anterior fontanelle open, soft, & flat, no cranial hematomas
EYES: conjunctiva, sclera, & pupils normal; red reflexes present bilaterally
EARS: normal position & rotation; canals present
NOSE: passages patent
MOUTH: palate intact; no deformities noted
NECK: supple, no masses palpated, clavicles intact
HEART: RRR, normal S1 & S2, no m/r/g

PULSES: 2+ brachial & femoral pulses bilaterally
LUNGS: CTA bilaterally, no tachypnea/retractions
ABDOMEN: soft, non-tender, non-distended; no masses, no hepatosplenomegaly; umbilicus clean and without erythema or induration
GU MALE: normal appearance; uncircumcised; testes in scrotum bilaterally
HIPS: negative Barlow & Ortolani
EXTREMITIES: no deformities, full range of motion
SKIN: no significant lesions, no nevus simplex, no mongolian spots
BACK: no midline defects
NEURO: cries but consolable; good Moro, suck, & grasp reflexes; normal tone & strength

Question 1. Based on the patient's history and physical, which of the following sets of diagnostic labs would it be most appropriate to obtain?

a. Blood culture and CBC
b. Urinalysis, urine culture, blood culture, and CBC
c. Urinalysis, urine culture, blood culture, CBC, CRP, and procalcitonin
d. Urinalysis, urine culture, blood culture, CBC, CRP, procalcitonin, and CSF studies

Explanation: The risk of bacteremia and bacterial meningitis is lower in infants 22-28 days of age compared to infants 8-21 days of age, but still greater than infants 29-60 days of age. This middle group's risk for bacterial meningitis may thus be evaluated with inflammatory markers which include temperature >38.5^{o}C, procalcitonin >0.5 ng/mL, CRP >20 mg/dL, and ANC >4000-5200/mm^{3}. Most clinics will not have the capability to perform these labs with a quick turnaround, so it would be appropriate to refer the patient to the ED for these labs and further possible workup and treatment.

Learning Goal: KAS 8-10

Question 2. The urinalysis comes back with negative leukocytes, negative nitrites and 0-3 WBC/hpf. CRP is 0.5 mg/dL (0-0.75 mg/dL) and Procalcitonin is 0.12 ng/mL (<0.25 ng/mL). Which of the following is the most accurate statement regarding obtaining cerebrospinal fluid studies in this patient?

a. CSF studies should be obtained
b. CSF studies should be obtained only if observation is to happen at home
c. CSF studies may be obtained (provider discretion)
d. CSF studies should not be obtained

Explanation: If any inflammatory markers are positive, CSF studies should be obtained to rule out bacterial meningitis. However, clinicians may obtain CSF studies on infants 22-28 days of age even if all of the following are met: urinalysis is negative, no inflammatory markers are abnormal, blood and urine cultures have been obtained, and the infant is hospitalized. If the provider elects to obtain CSF studies, its results are helpful in determining disposition for

admission versus close observation at home. Due to the decreased risk of bacterial meningitis in this age group, clinicians may also elect to defer CSF studies if all of the aforementioned criteria are met. Antimicrobial agents should be initiated in these circumstances with the understanding that there is a potential risk of partially treated meningitis. Families should be educated on the risks and benefits of performing a lumbar puncture, and the discussion with the family should be thoroughly documented. Close follow up in 24 hours should also be arranged.

Learning Goal: KAS 11-12

Question 3. You decide to refer the patient to the local pediatric emergency room for CSF studies, parenteral antibiotics, and admission. Based on how well the patient appears, your medical student asks if all of this is necessary. You explain to your medical student that:

a. The patient may be safely observed at home if CSF studies are obtained and are negative and close follow up can be arranged
b. The patient may be safely observed at home if CSF studies are obtained and are negative, parenteral antimicrobials are administered, and close follow up can be arranged
c. The patient should be admitted to the hospital for monitoring and receive parenteral antimicrobials regardless of CSF study results due to the high risk of morbidity and mortality to the infant
d. The patient should be admitted to the hospital for monitoring and receive parenteral antimicrobials only if CSF studies are concerning for bacterial meningitis due to the high risk of morbidity and mortality to the infant

Explanation: Infants 22-28 days with fever should be initially evaluated in a setting that allows for prolonged periods of observation, escalation of care if necessary, and where diagnostic testing (including a lumbar puncture) can be completed in a safe and timely fashion. Parenteral antimicrobials should be administered if there are any abnormal laboratory findings; although, parenteral antimicrobials may be administered even if urinalysis is normal, no inflammatory markers are abnormal, and CSF analysis is normal or enterovirus positive. If parenteral antimicrobials are administered in the setting of a completely negative work up, the option of observation at home with close follow up (within 24 hours) versus admission may be discussed. The shared decision making with family involving the risks and benefits of either option should be discussed clearly and subsequently documented in the medical record. If parenteral antimicrobials are not administered in the setting of a completely negative work up, the infant should be monitored in the hospital until cultures are negative for 24-36 hours and clinical improvement is seen in the patient.

Learning Goal: KAS 12-14

Case resolution: CSF studies are obtained on the patient and are positive for enterovirus. Blood and CSF cultures are otherwise negative at 36 hours. The patient defervesced 24 hours into the admission with

improved energy level and oral intake. Antimicrobials are discontinued and the patient is discharged home with outpatient follow up.

Citations:

Pantell R H, Roberts K B, Adams W G, et al. Evaluation and Management of Well-Appearing Febrile Infants 8 to 60 Days Old. Pediatrics. 2021;148(2):e2021052228