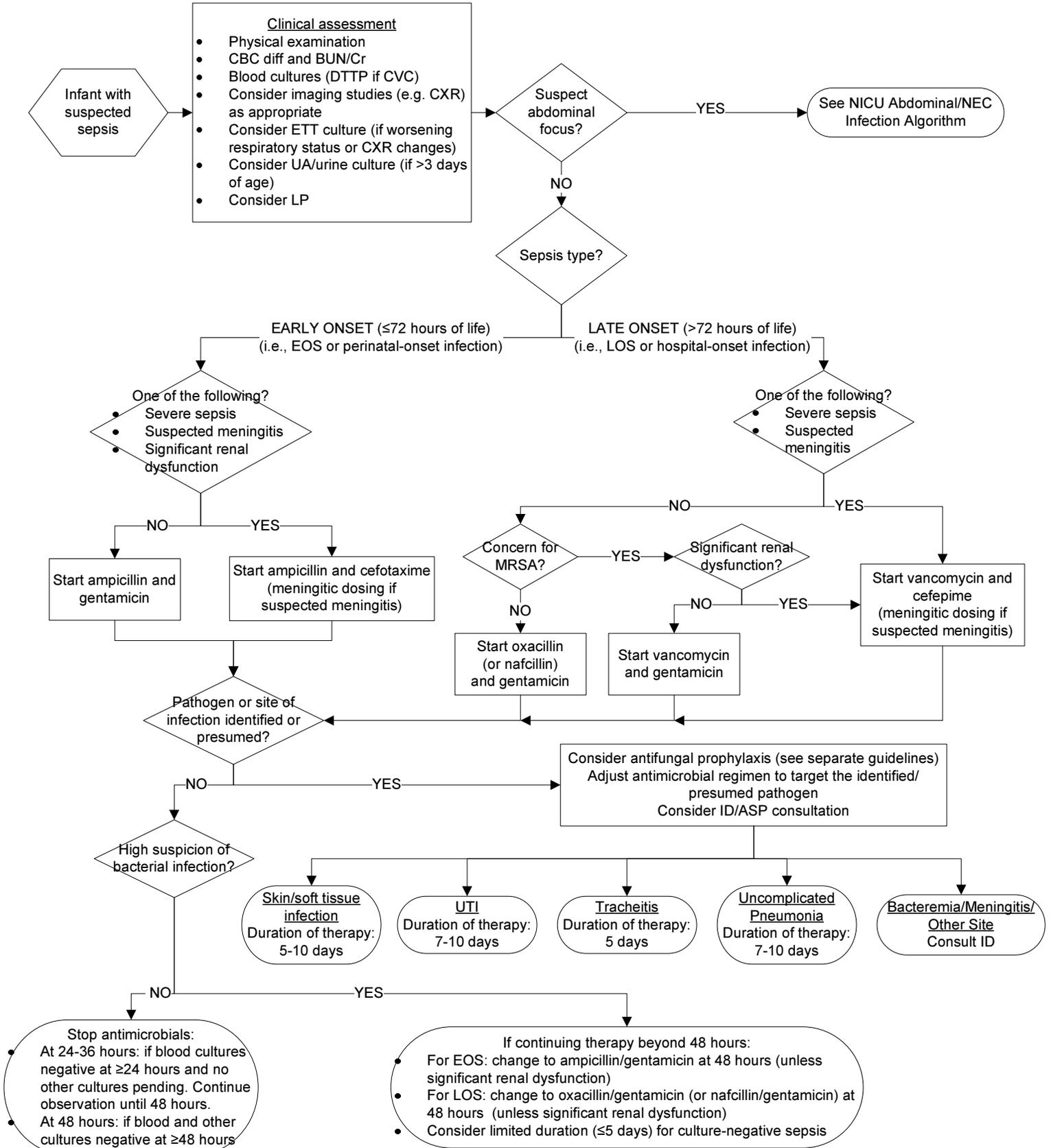


NICU Suspected Sepsis Algorithm

(for onset at birth or while in hospital)

This algorithm does not represent an exclusive course of management. Variations, taking into account individual circumstances, may be appropriate.



The Role of Lumbar Puncture in Infants at Risk for Meningitis in the Intensive Care Nursery

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1. Background

The neonatal period is most common time in life for bacterial meningitis. The overall incidence of meningitis is 0.03 - 0.3 per 1000 live births, however the incidence is much higher among preterm infants at a rate of ~ 0.7 per 1000 live births. In neonates with bacterial sepsis and positive blood cultures, 10-20% will also have culture-confirmed meningitis.

Neonates are more susceptible to CNS infection for the following reasons: 1) Deficiency in humoral and cellular immunity, phagocytic function, 2) low rates of immunoglobulins, 3) poorer complement and T-cell function, 4) Immaturity and increased permeability of the blood brain barrier.

Preterm hospitalized infants at highest risk of late-onset meningitis because most maternal immunoglobulins do not cross the placenta before 32 weeks, they have foreign, invasive devices in place and finally, they frequently have exposure to prolonged courses of empiric antibiotics >5 days which has been associated with increased odds of developing late-onset sepsis and meningitis

Finally, signs of neonatal meningitis are subtle and non-specific, especially in preterm infants. In patients with birth weights > 2500 g, fever, irritability, seizures, lethargy and bulging fontanelle were common signs. About ~75% of infants present with fever but no other individual sign in > 50% of cases. In patients with birth weights of < 2500g, apnea, jaundice, tachypnea and abdominal distension were common signs but no individual sign present in > 30% of cases (Krebs et al. 2007).

2. Consensus

a. LP is recommended in the following clinical situations:

i. Evaluation of Infants < 28 days old or < 40 weeks CGA with bacteremia (positive blood culture)

1. High rate bacteremia and concomitant in this population (~10-20% of infants with bacteremia can have meningitis)
2. Poor reliability of exam to distinguish meningitis vs sepsis in preterm infants or infants < 28 days

ii. Late onset sepsis rule out sepsis evaluation of infants < 28 days or < 40 weeks CGA IF planning to start antibiotics

1. These patients have significantly higher rate of late onset meningitis,
2. High rate of late-onset meningitis *without* bacteremia: ~30% of preterm infants will have negative blood cultures

b. When can LP be deferred?

i. Evaluation of infants with early onset sepsis, unless there are specific neurologic symptoms (seizures, abnormal neuro exam, bulging fontanelle) concerning for meningitis

1. Low rate of early-onset meningitis- 0.03 per 1000 live births overall, 0.7 per 1000 live births in preterm infants

2. Very low rate of early-onset meningitis without bacteremia

3. Important Considerations

- a. If the infant is stable enough for the procedure, the LP should be performed as soon as possible and prior to starting antibiotics
 - i. Delays in LP can cause delays in antibiotics! LP should be prioritized.
 - ii. Pre-treatment with abx clears the CSF quickly and CSF profile can be unreliable and miss meningitis (~15% of infants will have normal CSF WBC)
 - iii. CSF WBC is unreliable with a traumatic tap, often underestimates leukocytosis
- b. Contraindications for LP
 - i. Few reasons to defer given low risk of procedure and high mortality and morbidity of neonatal meningitis
 - ii. These include:
 - 1. Thrombocytopenia with platelet < 50 or significant coagulopathy: Should correct prior to LP
 - 2. Skin infection at planned site of LP
 - 3. Severely unstable infants at risk for cardiorespiratory compromise
- c. CSF WBC can be helpful up to 1 week after bacteremia, CSF WBC >25 has ~80% sensitivity and specificity
 - i. ~15% of meningitis will be missed if relying solely on the CSF profile