



EMERGENCY MANAGEMENT OF THE

Well-appearing Febrile Infant age 1 to 90 days

2013 UPDATE

This **evidence-based care process model (CPM)** was developed by Intermountain Healthcare's **Pediatric Specialties Clinical Program** in collaboration with the **Intensive Medicine Clinical Program**. It recommends a protocol for assessing, evaluating, and treating well-appearing infants age 1 to 90 days who present to the emergency department with a rectal temperature of 38°C or higher or with a reliable history of fever. Note that a separate document defines care for neonatal sepsis (Neonatal Early Onset Sepsis Clinical Pathway for Level I and Level II Nurseries) and that the Inpatient Management of Febrile Infants CPM complements this model.

This update reaffirms key points of the original 2008 model while adding clarification and new recommendations regarding testing.

KEY POINTS REAFFIRMED

- **Risk classification is crucial.** Testing and care shouldn't be the same for all infants with fever. Low-risk infants have approximately a 1.4% occurrence of serious bacterial infection (SBI), but some high-risk infants have an occurrence of up to 21%.^{1,2} Note that urinary tract infection (UTI) is the most common serious bacterial infection among febrile infants.
- **Lab tests (CBC and UA) are important for classifying infants as high or low risk for SBI.** Risk for SBI cannot be determined through physical examination alone. In a study of over 3,000 febrile infants, only 58% of those with bacteremia/bacterial meningitis appeared clinically ill.³ Along with consideration of the infant's age, CBC and UA results can help providers decide whether to admit or discharge to home.
- **Viral testing helps to classify infants further.** Testing for respiratory viruses should be performed throughout the year. Although RSV and influenza peak during the winter (November to April), other viruses circulate year-round. Since the incidence of enterovirus (EV) in febrile infants is particularly high in the summer (up to 50% higher in August and October), enterovirus PCR testing is recommended from June through November as well as with any finding of CSF pleocytosis.^{4,5,6}

NEW IN THIS UPDATE: clarification, new recommendations regarding testing

See pages 2 and 3 of this model for more detail on the points summarized below:

- **Enterovirus PCR testing.** Note that we recommend testing seasonally (June through November) — and always with a finding of CSF pleocytosis (>18 WBC for infants 1 to 28 days of age; >9 WBC for infants 29 to 90 days).⁵
- **RSV-positive results.** Any infant 29 to 90 days of age with a positive RSV result and temperature $\leq 38.5^{\circ}\text{C}$ does not require additional testing.
- **Rhinovirus-positive PCR results.** Intermountain data indicate that detection of rhinovirus alone is not significant in predicting a low risk for SBI.⁷ Treat as viral negative.
- **HSV signs.** Neonatal HSV is rare but serious. We recommend testing and treating infants age 42 days and younger with vesicular skin lesions, abnormal CSF, or seizures. Consider testing and treating if infant has a septic appearance. Discontinue acyclovir if HSV test results are negative.

► Why Focus ON FEVER IN YOUNG INFANTS?

Nearly 20% of emergency room visits for this age group are for evaluation of fever. While only 8% to 10% of babies will have serious bacterial infection (SBI), the consequences of a missed diagnosis are significant. Yet overtreating the 90% of infants who do not have SBI also poses risks.

What's needed is a consistent approach that effectively evaluates risk and treats infants appropriately. This model — and the companion CPM, *Inpatient Management of Febrile Infants* — outlines such an approach.

► RESULTS

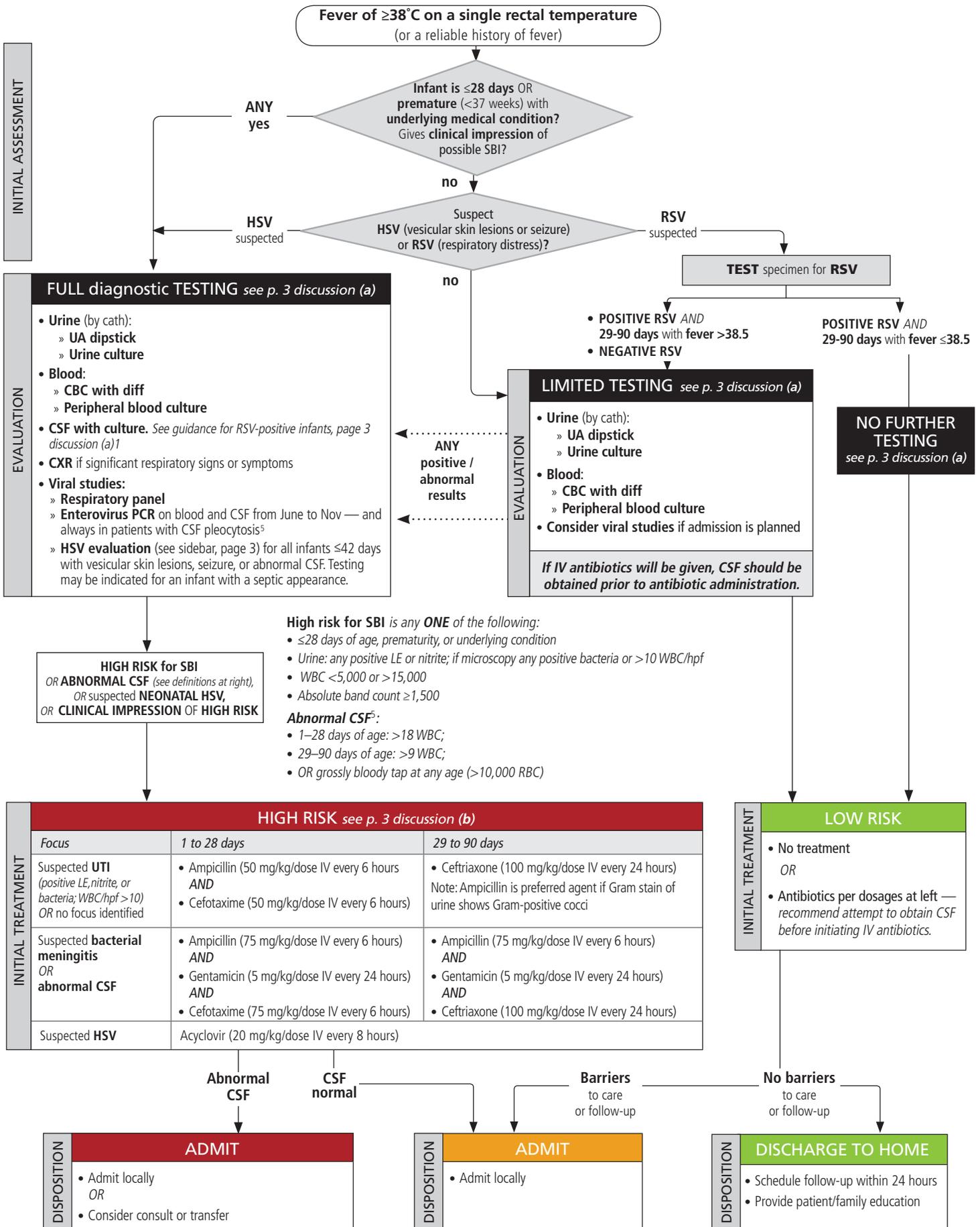
- **Pilot:** Early discharge based on the recommendations in this CPM was piloted on 100 infants at Primary Children's Medical Center and resulted in savings over \$3,000 per admission and a 98% satisfaction rating from parents.⁸
- **System-wide implementation:** This model has helped ensure that febrile infants 1 to 90 days of age consistently receive appropriate, evidence-based care at Intermountain hospitals. Since system-wide implementation in 2008, we have seen these improvements (shown as a % of our cases):
 - Initial lab testing to determine risk status (increased from 57% to 87%)
 - Appropriate viral tests conducted (increased from 56% to 74%)

Following implementation in our EDs, there have been no missed cases of meningitis.

► GOALS

- Ensure that appropriate labs are collected for infants age 1 to 90 days.
- Improve decision-making regarding the inpatient or outpatient management of the well-appearing febrile infant.

ALGORITHM: EMERGENCY CARE OF THE WELL-APPEARING FEBRILE INFANT 1–90 DAYS OF AGE



DISCUSSION

(a) Laboratory studies

1. **RSV-positive results.** Follow these guidelines:

- At any age, if you intend to give antibiotics, complete full diagnostic testing, including blood, urine, and CSF cultures.
- For infants 28 days or younger with confirmed RSV, the physician may elect to test blood and urine and to observe inpatient without antibiotics. The most common cause of SBI in this group is UTI with or without bacteremia.^{9,10,11} Bacterial meningitis is very rare in infants with confirmed RSV.⁹
- If the infant is 29 to 90 days of age and the temperature is $\leq 38.5^{\circ}\text{C}$, no additional lab testing is needed and the infant may be treated as low risk for SBI. (These infants have less than 2% risk of any SBI).^{2,12}

2. **Urinalysis results.** Urinalysis should be performed for all febrile infants to determine the presence of leukocyte esterase (LE), nitrite, or bacteria; or $>10\text{WBC/hpf}$. The only exception is in infants 29 to 90 days of age with confirmed RSV infection and a temperature $\leq 38.5^{\circ}\text{C}$; these infants do not need UA testing. In an Intermountain study of over 5,000 febrile infants, LE was the single best test for identification of UTI in febrile infants. An LE result of trace or greater predicted UTI with a sensitivity of 87%. In addition, 98% of febrile infants with negative LE results had no UTI predicted.

3. **Collecting samples for bacterial studies.** Samples for all planned bacterial studies should be gathered before any antibiotic treatment is begun. Collecting CSF or blood samples after antibiotics have been started may result in false negative results.

4. **Viral studies.** Viral studies can help determine risk for SBI; infants with a virus (other than rhinovirus) are less likely to have SBI.

- **Testing for respiratory viruses is recommended year-round.**^{2,6} Note that although rhinovirus is the most frequently identified virus, Intermountain data indicate that **detection of rhinovirus alone is not significant in predicting a low risk for SBI.** Infants with only rhinovirus detected have the same risk of SBI as viral negative infants (approximately 12%).⁷ Treat as a viral negative result; use clinical judgment for discharge planning.
- **Enterovirus PCR on blood and CSF is recommended from June through November and with all findings of CSF pleocytosis.**^{4,5}

5. **HSV: signs, testing, treatment.** HSV infection is less common than SBI, but often results in significant morbidity and mortality in this age group. Initial signs of HSV infection can occur any time between birth and approximately 6 weeks of age.¹³ We recommend testing for HSV when infants fulfill the criteria noted in the box at right. Infants who are evaluated for HSV should receive IV acyclovir therapy pending the results of diagnostic testing.^{14,15,16}

Note: when obtaining lesion and surface culture samples, use a new swab for each site to eliminate the possibility of spreading infection. (Swabs may be placed in same tube for a single, multisite analysis.)

(b) Medication

Data from 1999 to 2011 from Primary Children's Medical Center and across Intermountain show that *E. coli* remains the most common cause of SBI in infants 1 to 90 days of age. Antibiotics selected for treating SBI should be active against both Gram-negative and Gram-positive causes of SBI. Because ampicillin resistance occurs in over 50% of SBI pathogens, addition of a third-generation cephalosporin is recommended in all cases of suspected bacterial meningitis or abnormal CSF. Acyclovir is the treatment for suspected HSV.

Obtain guidance from a pediatric infectious disease specialist in these cases:

- **If *S. aureus* is suspected.** None of the recommended regimens presented in the algorithm is appropriate for treatment of *Staphylococcus aureus*; consult a specialist to determine an alternate regimen.
- **If bacterial meningitis or HSV infection is suspected or confirmed.**

Urinary tract infection (UTI) is the most common serious bacterial infection among febrile infants.

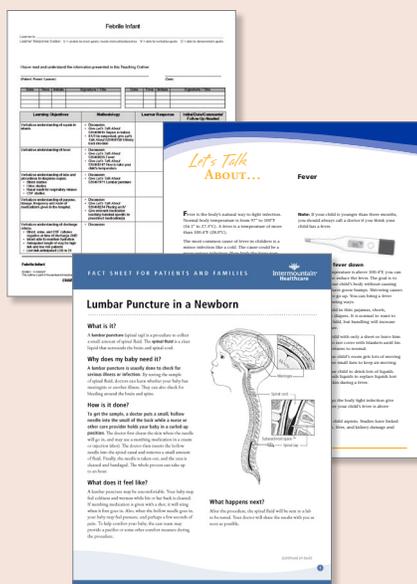
Data from over 8,000 febrile infants seen at Primary Children's Medical Center show that approximately 10% of all febrile infants have an SBI. Of these, UTI accounts for 80%.

HSV EVALUATION

- **42 days or younger:**
 - **TEST* AND TREAT** if infant exhibits **vesicular skin lesions, abnormal CSF, or seizures.**
 - **CONSIDER TESTING* AND TREATING** if infant exhibits **septic appearance.**
- **Older infants:** primary HSV is rare in infants older than 42 days. Infectious disease team consult may be indicated.

***TESTING** for HSV:

- Order blood PCR, CSF PCR, culture/PCR of skin lesions, culture/PCR of surface sites (mouth and throat, eyes, umbilicus, perirectal).
- With HSV testing, consider infant "High Risk" — begin treatment per the algorithm.



RESOURCES

Patient and provider tools relating to care of the febrile infant are available on the Clinical Programs website at: intermountain.net/clinicalprograms. Select the "Febrile Infant" topic page to access the following tools:

- This CPM
- A related CPM for *Inpatient Management of the Febrile Infant*
- Febrile Infant Admission Orders
- Patient education



CAREGIVER EDUCATION

Caregiver education is a critical part of discharge planning. Education for caregivers of febrile infants should include the following topics:

- How to give prescribed medication
- How to take their baby's temperature
- Signs of dehydration
- Steps to take to reduce fever and prevent the spread of infection
- The importance of returning for follow-up appointments

Several fact sheet and "Let's Talk About..." handouts are available to guide caregiver education. These are available on intermountain.net/clinicalprograms on the "Febrile Infant" topic page.

- Lumbar Puncture in a Newborn
- Fever
- Urinary tract infection
- Sepsis in babies
- How to take your child's temperature
- How to give medicine
- Placing an IV

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This CPM is based on best evidence at the time of publication. It is not meant to be a prescription for every patient.

Clinical judgment based on each patient's unique situation remains vital. We welcome your feedback; contact Carolyne.Reynolds@imail.org