

**THE PEDIATRICS FOR EMERGENCY
PHYSICIANS NETWORK**

**OTHERWISE HEALTHY
WELL-APPEARING
INFANTS & CHILDREN
(0-36 MONTHS OLD)
WITH FEVER**

IN THE POST-VACCINATION ERA

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I. Definition of Terms:

1. Sepsis: Presence of bacteria in the bloodstream of a toxic-appearing infant or child.
2. Bacteremia: Presence of bacteria in the bloodstream of a well-appearing infant or child.
3. Complications of Bacteremia:
 - “Serious Bacterial Infections” (SBI):**
 - Fulminant septicemia
 - DIC
 - Shock and multiple organ failure
 - Meningitis
 - Bacterial gastroenteritis
 - Serious focal infections
 - Death


CLINICAL CONCERN:
IDENTIFYING THOSE WELL-APPEARING INFANTS WITH FEVER WHO MAY BE BACTEREMIC AND PROGRESS TO DEVELOP A LIFE-THREATENING SERIOUS BACTERIAL INFECTION (SBI)

4. “Partial Sepsis Workup”:
(Infants ≥ 61 days old)
 - 1. CBC and differential
 - 2. Blood culture
 - Only if indicated:
 - CXR
 - Stool culture
 - Urinalysis and urine culture
5. “Full Sepsis Workup”:
(Infants ≤ 60 days old)
 - 1. CBC and differential
 - 2. Blood culture
 - 3. Straight-cath urine for urinalysis and culture
 - 4. Lumbar puncture
 - Only if indicated:
 - CXR
 - Stool gram stain & culture

A full sepsis workup is essentially a Partial Sepsis workup (always including urine) plus an L.P.

6. “Post-Vaccination Era”: Since 2000. Widespread immunizations with HIB (against H Flu) and Prevnar (against the most common strains of Pneumococcus) dramatically reduced the risk of bacteremia/SBI in 3-36 month old patients presenting to the ED with fever (**Risk: 0.25 %**).
7. “Pre-Vaccination Era”: Prior to 1990’s, when prevalence of virulent strains of both Haemophilus Influenzae type b (Hib) & Pneumococcus was much higher, & therefore risk of bacteremia/SBI in healthy infants and children 3-36 months old presenting to the ED with fever was also much higher (**Risk: 3-11%**).

II. Normal Vital Signs in Infants

NORMAL VITAL SIGNS IN INFANTS			
AGE	RR	HR	SYSTOLIC BP
Full-term newborn (< 1 month)	40-60		60 (FT newborn)  70 (12 months)
1-5 months	30-50	100-168	
6-12 months	20-40	100- 168 (≤ 6mo) 100-160 (7-12 mo)	

NOTE: Respiratory rates should always be counted for 30 seconds, because infants have irregular periodic breathing (due to immature respiratory centers). Counting for < 30 seconds will produce falsely high, normal, or low results.

III. Evidence-Based Heights of Fever You Should Know :

100.4°	Triggers workup in infant ≤ 90 days old.
102. ²	Lowest fever associated with significant risk of bacteremia/SBI in well appearing older infants (ie- ≥ 3 months old). Pre-Vaccination Era bacteremia/SBI risk: Risk: 3-11%. Post-Vaccination Era bacteremia/SBI risk: 0.25% (VERY low) Since risk is low, triggers workup only if: 1) unreliable follow-up; or 2) inadequately immunized; or 3) < 6 months old; or 4) h/o prolonged fever (ie- ≥ 4 days).
106°	Still within range of fever seen with viral illnesses, but higher than most . In one recent study (Trautner,et al), 84 previously healthy children who presented to the ED with fevers ≥ 106° were found to have significantly high rates of both non-pneumococcal SBI (8.3%) and non- pneumococcal bacteremia (3.6%) .

Children with history of documented fever who are afebrile in the emergency department should be considered to be febrile to the degree reported by history.

Temperature in the ED should be measured using a rectal thermometer, because axillary, oral and tympanic thermometers are unreliable in infants and young children.

IV. Evidence-Based Rationale for Risk Stratification of Infants According to Age and Height of Fever:

Evidence-Based Rationale	Risk Stratification Decision
Younger infants (≤ 90 days old) have less well-developed immune systems and are more immunocompromised than older infants.	Lower fever (≥ 100.4) triggers workups in younger infants (≤ 90 days old).
	Changes consistent with illness (decreased suck/feeding or irritability/somnolence) triggers a workup in younger infants, even in absence of fever.
Higher risk of bacteremia at higher fevers.	Higher levels of fever trigger workups even in older more immunocompetent infants.
Very young infants (≤ 60 days old) do not clinically demonstrate signs of meningitis.	Lumbar puncture always performed as part of fever evaluation in infants ≤ 60 days old with or without any clinical signs of meningitis.

V. Risk Stratification of Infants According to Age and Height of Fever:

When evaluating a well-appearing infant with fever, the first step is to note patient's age (calculate age in days, if infant ≤ 90 days old) and height of fever, and see which of the following risk groups the patient falls into:

GROUP	AGE	HEIGHT OF FEVER TO TRIGGER WORKUP
I.	0-28 DAYS	100.4 ⁰
II.	29-60 DAYS	
III.	61-90 DAYS	
IV.	3-6 months	102.2 ⁰
V.	≥ 6 months	105 ⁰ or 105.5 ⁰

IV. Overview of Management

An Overview of the Evaluation and Treatment of Previously Healthy Well-Appearing Febrile Infants & Children 0-36 Months						
Group	Age Cutoff	Fever Cutoff	Evaluation	Results	Treatment	Disposition
I	0-28 days	$\geq 100.4^{\circ}$	Full Sepsis Workup (Blood, urine, LP)	All patients	IV Antibiotics	Admit
II	29-60 days	$\geq 100.4^{\circ}$	Full Sepsis Workup (Blood, urine, LP)	Low Risk Criteria met*	IM or IV Antibiotics	Discharge
				Low Risk Criteria NOT met*	IV Antibiotics	Admit
III	61-90 days	$\geq 100.4^{\circ}$	Partial Sepsis Workup (Blood & urine only)	UTI Cellulitis Pneumonia (focal infiltrate)	IV Antibiotics	Admit
				All other patients	IM or IV Antibiotics if WBC count < 5K & $\geq 15K$	Discharge
IV	3-6 months	$\geq 102.2^{\circ}$	Partial Sepsis Workup (Blood & urine only)	ALL PATIENTS	IM or IV Antibiotics if WBC $\geq 15K$	Discharge
	or ≥ 6 months AND Not immunized OR No reliable follow up	ANY fever ($\geq 100.4^{\circ}$) lasting ≥ 4 days	Urine only		or PO Antibiotics if positive urine	
V	≥ 6 months	Option 1: $\geq 105.0^{\circ}$ Option 2: $\geq 105.5^{\circ}$ or Fever ≥ 4 days when Tmax $\geq 102.2^{\circ}$	Partial Sepsis Workup: 1. BLOOD → ALL PTS 2. TEST URINE IF PT AT RISK FOR UTI**	ALL PATIENTS	IM or IV Antibiotics if WBC $\geq 15K$	Discharge
		$\geq 102.2^{\circ}$ or ANY fever ($\geq 100.4^{\circ}$) lasting ≥ 4 days	URINE ONLY if at risk for UTI**		or PO Antibiotics if positive urine	

*LOW RISK CRITERIA FOR GROUP II:

HISTORY: Full-term & previously healthy, completely normal behavior and feeding, reliable caretaker/phone access, reliable 24-hour followup.

EXAM: Well appearing, completely normal vitals and exam.

LABS: BLOOD: WBC $\geq 5K$ and $< 15K$; B:N < 0.2 ; URINE: < 10 WBC/HPF; CSF < 8 WBC/HPF.

**PATIENT GROUPS AT RISK FOR UTI:

1. Girls < 2 yo
2. Boys < 6 mo if circumcised
3. Boys < 1 yo if uncircumcised
4. History of UTI in the past

VII. Workups:

FULL SEPSIS WORKUP FOR ALL 0-60 DAY OLDS:	
CBC and differential	
Blood culture	
Catheterized urine:	Dipstick & microscopic urinalysis, Gram stain and culture
Lumbar puncture:	Cell count & differential Protein/glucose Gram stain and culture
Stool gram stain and culture	> if clinically indicated
Chest X-ray	

PARTIAL SEPSIS WORKUP FOR OLDER INFANTS (≥ 61 DAYS OLD)	
CBC and Differential	
Blood culture	
Urinalysis and urine culture:	
	Girls < 2 yo
	Boys:
	Circumcised < 6 mo
	Uncircumcised < 1 y.o.
	Previous H/O UTI (any age)
CXR	> only if indicated
Stool gram stain and culture	

VIII. GROUP #I: 0-28 DAYS OLD:

Why have these babies (0-28 days) been singled out as a group?

REASONS WHY BABIES 0-28 DAYS OLD ARE HIGHEST-RISK GROUP FOR LIFE-THREATENING BACTERIAL DISEASE AND ALWAYS GET ADMITTED

High prevalence of bacteremia and (SBI): 5% - 17 %

Pathogens not community-acquired, so prevalence not reduced in immunized populations

Immune system immature:

More susceptible to invasive disease
Unable to localize infections well
Do not demonstrate symptoms early in illness observation
Appearance and exam unreliable

***Screening tests/labs not sensitive**

3-10% of bacterial disease miss by currently available screening criteria.

***THEREFORE, ANY FEVER ($\geq 100.4^{\circ}$) IN THIS AGE GROUP MANDATES A
FULL SEPSIS WORKUP FOLLOWED BY ADMISSION FOR IV ANTIBIOTICS: ****
IV Cefotaxime (50mg/kg) q6H + Ampicillin (50mg/kg) q6H.

****Add IV Acyclovir if any of the following:**

- Ill-Appearance
- Maternal h/o HSV
- Presence of vesicular or pustular lesion(s)
- Associated seizure

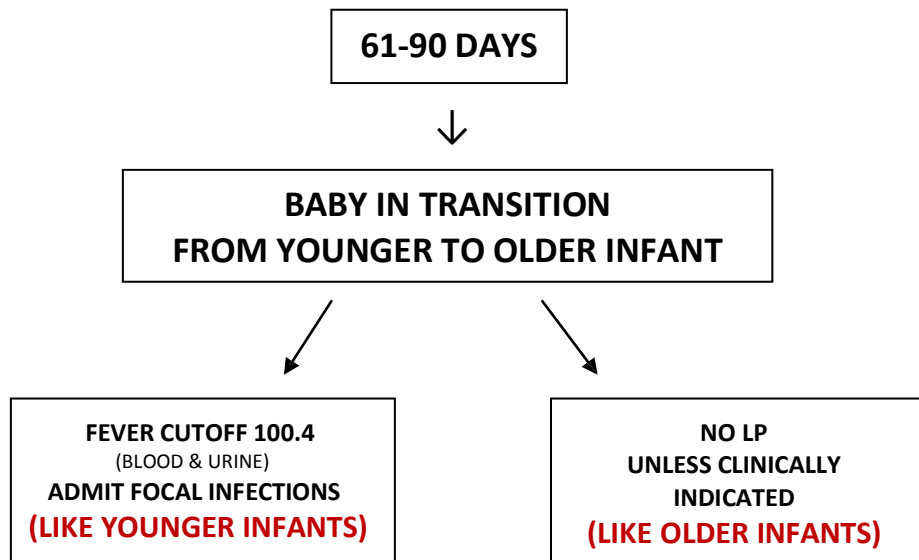
IX. GROUP #2: 29-60 DAYS OLD

Low-Risk Criteria for Discharge from ED:

LOW RISK CRITERIA FOR DISCHARGE OF INFANTS 29-60 DAYS OLD:
HISTORY: Previously healthy, full-term Normal behavior and feeding Reliable caretaker with phone access Caretaker able to return to ED if recalled for positive culture Reliable 24-hour followup for re-evaluation following ED discharge
EXAM: Well-appearing Normal vital signs and exam
LABS: Blood: WBC $\geq 5,000$ and $< 15,000$ and band to neutrophil ratio < 0.2 Urine: Negative gram stain, negative dipstick urinalysis, and micro < 10 WBC/HPF CSF: < 8 WBC/HPF, negative gram stain, and normal protein & glucose Stool: < 5 WBC/HPF on gram stain (obtain only if diarrhea) CXR: Normal (obtain only if respiratory symptoms)

- Any infant 29-60 days old who does not meet all of these low-risk criteria must be admitted for IV antibiotics and observation.
- For discharged patients, antibiotic coverage (ceftriaxone 50mg/kg IM) is optional.
- Discharged patients must be re-examined every 24 hours by PMD or ED physician for next 48 hours until cultures negative and then followed closely until fever resolves.
- Caretaker must be deemed reliable by examining physician, accessible by phone (in case cultures become positive and patient needs to be recalled for admission), and instructed to return immediately if any decreased feeding or change in baby's appearance or behavior.
- If blood, urine, or CSF culture becomes positive (or change in feeding, appearance, or behavior) admit for IV antibiotics.

X. GROUP #3: 61-90 DAYS OLD:



RATIONALE FOR GROUP #3

The Group #3 age (ie- 61 thru 90 days) is a transitional age and has aspects of both younger (Group 2I) and older (Group 4) groups:

- 1) Still less immunocompetent to some degree (ie- like the younger Group II infants), the fever cutoff for a workup remains 100.4.
- 2) Based on the collective experience** of many ED's, like older infants (ie-Groups 4 & 5) we do not routinely LP these infants if they are behaving completely well.. However, a very low threshold for LP should be maintained for ANY clinical signs that might suggest meningitis (decreased behavior or feeding, fussiness, etc).

****NOTE:** The 2003 "ACEP Clinical Policy for Children Younger Than Three Years Presenting to the Emergency Department With Fever" (listed in Bibliography section) recommends to "consider routine LP up to 90 days old". In the face of a lack of evidence/studies in this (Group 3) 61-90 days old age group, some practitioners still routinely LP well-appearing febrile infants up to 90 days old.

3) FYI---VARIATIONS IN PRACTICE YOU SHOULD BE AWARE OF:

Not all emergency physicians admit Group 3 patients with focal infections:

Group B Strep is an invasive infection that may present as cellulitis in infants up to 3 months old, and for this reason Group 3 infants with cellulitis can be considered for admission. While in the past UTI and pneumonia were always admitted in this age group, recently some practitioners have begun discharging these patients to close outpatient followup, but ONLY if the baby is clinically COMPLETELY well (normal vitals, feeding, and behavior) AND meticulous follow-up with the PMD is available. However, since such followup is not always available, our guideline adopted the more conservative approach as acceptable for widespread use by emergency physicians.

XI. GROUP #4 and Group #5: OTHERWISE HEALTHY AND WELL-APPEARING INFANTS \geq 3 MONTHS OLD (\geq 91 DAYS OLD):

1. **What distinguishes these infants as distinct groups?**

These infants represent the largest group of febrile babies seen in the ED, with the most variation in diagnostic and management options. The purpose of this section is to demystify their evaluation and management.

2. **A clarification about the following discussion:**

There are always 4 types of fever that can occur in otherwise well-appearing infants:

1. A typical viral-like picture:
Fever that is not too high ($< 105^{\circ}$) and not too long duration (< 5 days) in an otherwise healthy infant (no significant PMH).
2. Prolonged fever (≥ 5 days)
3. Very high fever ($\geq 106^{\circ}$)
4. Fever in patients with co-morbidities.
(Sickle cell, cancer, HIV, DM, indwelling central lines, etc.)

Therefore, you will always need to classify your patient with fever into one of these four categories, because the approach to each type of fever is different. However, the following discussion applies only to the first type of fever:

The otherwise healthy infant (no co-morbidity) who appears well, with a typical fever ($< 105^{\circ}$ and < 5 days duration). This type of fever comprises the majority of ED visits by infants for fever.

3. **What are the main issues to focus on when evaluating an infant with fever?**

4 major issues must be addressed in **ALL** patients with fever:

1. Hydration status
2. Is the patient septic?
3. Is the patient bacteremic?
4. Does the patient have a focal bacterial infection* that requires antibiotics?

*** Focal Bacterial Infections:**

Meningitis

Otitis media

Strep. pharyngitis

Pneumonia

UTI

Petechiae

Cellulitis

always fully undress patient
and examine skin

Therefore, your history and physical should always focus on these 4 issues. We will now discuss each of these 4 issues individually:

1. HYDRATION STATUS

HISTORY:

1) Quantify change, if any, in po intake:

Is baby breast-feeder or bottle-feeder?

If bottle-feeder: **How many oz does baby normally (pre-illness) feed? How often?**

During present illness, how many oz per feed and how often is baby feeding?

If Breast-feeder: **Normally (pre-illness), how many minutes is baby feeding on each breast? How often?**

During present illness, how many minutes on each breast and how often?

2) **Is the baby still sucking vigorously during feeds? Does the baby get SOB during feeds (have to stop feeding in middle of feed due to trouble breathing)? These can be early signs of more significant illness in a baby who otherwise appears well.**

3) **Is there any vomiting or diarrhea?**

If yes, quantify color (? bloody or bilious), number of episodes per day, and volume. This information will help you decide if patient is a candidate for p.o. hydration (i.e. decreasing frequency/volumes of vomiting/diarrhea), or needs IV hydration (large volumes, not holding po liquids, or increasing frequency of vomiting and/or diarrhea).

4) **Quantify frequency of urine output (#of wet diapers per day) compared to normal.**

5) **Ask about any change in activity or playfulness (for babies < 90 days old, ask if baby is waking up for feeds and sucking well, and level of alertness and consolability).**

Earliest signs of significant dehydration:

- 1. Decreased urine output (less wet diapers/day)**
- 2. Decreased activity**

A less vigorous suck, decreased feeding, or SOB while feeding can be early signs of more significant illness in an otherwise well-appearing infant.

2. ? SEPSIS

If vitals are stable (normal for age) and infant well-appearing, patient not septic.

Consider sepsis if:

Ill-appearing

Unstable vitals

***Persistent or marked tachycardia**

Wide pulse-pressure

Mottled skin or delayed capillary refill

**Even if patient appears
otherwise well**

***Differential diagnosis of tachycardia out-of-proportion to degree of fever:**

Hypoxemia – (check pulse ox)

Dehydration – (give IV fluids and reassess)

**Sepsis - (if remains very tachycardic, even after
antipyretics and IV fluids)**

**Myocarditis – (if EKG changes, OR if cardiomegaly or
CHF on CXR. Also test for troponin)**

3. ? BACTEREMIA

Definition: Presence of bacteria in the blood of a well-appearing child.

Risk: 1) Unimmunized infant, < 6 months old, with rectal temperature $\geq 102.2^{\circ}$ (EITHER in ED or by history at home).
2) Immunized infant, ≥ 6 months old, with rectal temp 105°F or 105.5°F .

Rationale: $\geq 97\%$ of bacteremia in children ≥ 3 months old caused by pneumococcus or H. flu. The H. flu (HIB) and pneumococcus (Prevnar) vaccines are given at 2, 4, and 6 months of age. Risk of bacteremia in a “fully immunized” infant (ie- infants ≥ 6 months old, who have received all 3 vaccines) is about 0.2% (very low), and in these infants 80% of bacteremia (ie- 80% of the 0.2%) resolves spontaneously, without antibiotic treatment. Therefore, adequately vaccinated infants ≥ 6 mo old (ie- ≥ 2 vaccinations) who are well appearing do not require a workup, unless high or prolonged fever concerning for \uparrow risk of bacteremia/SBI.

Strategy: Infants 3-6 months old with $T_{\text{max}} \geq 102.2$ get CBC, blood culture, and urine. (Because: 1) Those babies < 4 months have had only 1 immunization; AND 2) Babies < 6 months as a group have less behavioral range, making clinical judgement of overall well-appearance more challenging). A WBC < 15,000 indicates low risk of bacteremia: No antibiotics, 24-48 hour follow-up. (Make sure parents seem reliable & the patient has reliable access to 24-48 hour follow-up).

Infants ≥ 6 months old, who appear well, and have had at least 2 vaccinations (ie- usually given at 2 & 4 months old), & also have reliable 24-48 hour f/u, no workup is needed (meaning no CBC & blood culture) unless baby has any indication listed in the table below:

IMMUNIZED (HIB , PREVNAR VACCINES) PATIENTS ≥ 6 MONTHS OLD FOR WHOM BACTEREMIA WORKUP AND ANTIBIOTIC TREATMENT SHOULD BE CONSIDERED:
<p>1. Ill-appearance</p> <p>2. *Very high fever ($\geq 105^{\circ}$ – or 105.5°) OR **Prolonged fever * Fever $\geq 106^{\circ}$ may be associated with bacteremia risk up to 3.6% **Prolonged fever = ≥ 4 days (if T_{max} reached 102.2)</p> <p>3. Unreliable follow-up</p> <p>4. Incompletely immunized (< 2 immunizations)</p>

4. ? FOCAL BACTERIAL INFECTIONS (≥ 3 MONTHS OLD):

MENINGITIS –

Consider LP if: Lethargic
 Fussy or difficult to console
 Bulging fontanelle

OTITIS MEDIA – Diagnosed by exam

STREP PHARYNGITIS – no testing routinely indicated if < 3 y.o.
(since no significant risk of rheumatic fever in < 3 y.o, no
need for strep testing before this age)

PNEUMONIA - Consider CXR if:

Tachypnea (after defervescence)
Localized lung findings on auscultation
Retractions
Hypoxemia (pulse ox)
Significant cough
WBC $\geq 20,000$
H/O Fever $\geq 106^{\circ}$

UTI - Consider straight-cath urinalysis & culture if at risk* for UTI:

*Circumcised boy < 6 mo
*Uncircumcised boy < 1 y.o
 *Girl < 2 y.o
*h/o UTI in past (regardless of age)

CELLULITIS - Consider admission if < 3 months* or cellulitis is source of fever
 *(Group B Strep {GBS} may present as cellulitis in infants up to 3 months old)

PETECHIAE - Always undress and examine entire infant/child for presence of
petechiae with fever. If ANY petechiae:

- 1) Get blood culture, CBC/ differential (r/o ITP & neutropenia)
- 2) Give ceftriaxone (50mg/kg) IV or IM.

Then:

Observe in ED x 4-6 hours **

** {CAVEAT:If patient on initial ED exam “showered” with many
petechiae, admit for IV antibiotics & observation}.

If NONE of the following:

ANY purpura, ill-appearance/behavior, delayed capp refill,
leukopenia (ie- $< 5K$), neutropenia, thrombocytopenia (ie-ITP),
WBC $> 15K$, CRP > 6 , or increase number of petechiae while in
ED.

Then:

Discharge to reliable 24 hour followup

(For re-eval & 2nd dose ceftriaxone pending final blood cx result)

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